

126052

JPRS-CST-87-008

6 MARCH 1987

DTIC QUALITY INSPECTED 2

# China Report

SCIENCE AND TECHNOLOGY

19981120 208



FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY  
U.S. DEPARTMENT OF COMMERCE  
NATIONAL TECHNICAL  
INFORMATION SERVICE  
SPRINGFIELD, VA. 22161

5  
116  
A06

#### NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

#### PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-CST-87-008

6 MARCH 1987

## CHINA REPORT SCIENCE AND TECHNOLOGY

### CONTENTS

#### NATIONAL DEVELOPMENTS

Fang Yi Urges Science, Technology Reform (Meng Xiangjie; XINHUA Domestic Service, 25 Dec 86) .....	1
Reform of Scientific Research System Announced (XINHUA, 5 Jan 87) .....	3
S&T Research Funding Reform Sees Initial Success (XINHUA Domestic Service, 4 Feb 87) .....	4
National Defense Technology Discussed (BEIJING KEJI BAO, 13 Aug 86) .....	5
Interview With Military Industrial Academy Director (Zhu Wenqin; GUANGMING RIBAO, 3 Nov 86) .....	6
Potential for Exporting Technology Discussed (JISHU SHICHANG BAO, 5 Aug 86) .....	9
Examples Cited	9
Commentary on Technology Exports	10
Machinery Industry To Import Advanced Technology Items (ZHONGGUO JIXIE BAO, 14 Aug 86) .....	12
Technology Imports Situation Discussed (JISHU SHICHANG BAO, 29 Jul 86) .....	13
Joint Ventures in Health Care (XINHUA, various dates) .....	15

Cui Yueli on Sino-Foreign Cooperation	15
Pharmaceutical Industry Cooperation	15
Focus on Traditional Health Measures	
(XINHUA, various dates) .....	17
200 Traditional Medicine Hospitals Planned	17
More Demand for Herb Medicines	17
Qinghai Researches Mongolian, Tibetan Medicine	18
More Traditional Doctors To Be Trained	19
New Measures in Domestic Health Care	
(Various sources, various dates) .....	20
Measures To Encourage Private Health Care, by Nie Lisheng	20
Cui Yueli Speaks on Medical System Reform	21
State Climatology Commission Formally Established	
(XINHUA, 5 Feb 87) .....	23
Improved Meteorological System Provides Better Forecasts	
(XINHUA, 2 Feb 87) .....	24
Guilty Verdict Dampens Technical Consulting Activities	
(Sang Heng; GUANGMING RIBAO, 3 Dec 86) .....	25
Technical Experts Urged To Work in Underdeveloped Areas	
(XINHUA, 28 Dec 86) .....	27
CAS Leader Speaks on Reform	
(RENMIN RIBAO, 21 Aug 86) .....	28
Trends in Basic Sciences Discussed	
(BEIJING KEJI BAO, 16 Jul 86) .....	30
Xinjiang CAS Support of Applied Research Discussed	
(RENMIN RIBAO OVERSEAS EDITION, 30 Aug 86) .....	31
Necessary Conditions for Soft Science Discussed	
(RENMIN RIBAO, 24 Aug 86) .....	33
CAS Stresses Practical Applications	
(Wu Ming; XINHUA Domestic Service, 21 Jan 87) .....	36
CAS Cooperation With Harbin Enterprises Reported	
(JISHU SHICHANG BAO, 29 Jul 86) .....	37
Promoting Exchange of Talented Personnel Discussed	
(JISHU SHICHANG BAO, 12 Aug 86) .....	39
Situation of Beijing's S&T Personnel Analyzed	
(Cui Zihang; BEIJING KEJI BAO, 8 Aug 86) .....	41

S&T Personnel Urged To Go Where Needed (Miao Jiasheng, Fan Guilan; GUANGMING RIBAO, 14 Aug 86) ..	42
Bonus Makes New Technical Worker Highest Paid Plant Employee (Lu Liang, et al.; GUANGMING RIBAO, 30 Nov 86) .....	44
Compensated Assignment System for Graduates Discussed (Gu Yonggao; GUANGMING RIBAO, 2 Dec 86) .....	46
Wuyi University Fosters Range of Talent (CHINA DAILY, 27 Dec 86) .....	48
Jiangmen Biotech Base Makes Headway (CHINA DAILY, 27 Dec 86) .....	49
New Passenger Plane Production Plans Detailed (XINHUA, 12 Jan 87) .....	50
Law on Technical Contracts To Be Issued (XINHUA, 12 Jan 87) .....	51
Li Guixian Calls on S&T To Benefit Anhui Economy (ANHUI RIBAO, 7 Dec 86) .....	53
Beijing To Focus on Automation Technology (Yan Xiaojun; BEIJING KEJI BAO, 1 Sep 86) .....	54
Technology Development Groups Arise in Beijing (XINHUA, 25 Jan 87) .....	56
Beijing Education, Research Cooperation Group Formed (Gu Yonggao; GUANGMING RIBAO, 7 Dec 86) .....	57
Guangdong Awards Scientific Achievements (XINHUA, 23 Dec 86) .....	58
Haidian's 'Electronics Street' Home of S&T Ventures (Xu Jiuwu; GUANGMING RIBAO, 30 Nov 86) .....	59
Jilin Scientists Win National-Level Honor (Jilin Provincial Service, 25 Jan 87) .....	63
Spark Plan Measures in Jilin Reported (JISHU SHICHANG BAO, 12 Aug 86) .....	64
National Forum on S&T Reform Held in Shenyang (Liaoning Provincial Service, 5 Jan 87) .....	66
Science Development in Shenzhen Reported (JISHU SHICHANG BAO, 5 Aug 86) .....	67
PRC Students Study in Hong Kong Discussed (RENMIN RIBAO OVERSEAS EDITION, 23 Aug 86) .....	70

ERRATUM: In JPRS-CST-87-002 of 21 January 1987 please change headline on page 27 to read: "Rotor-Forging Technology Passes State Tests."

#### Briefs

Gansu Synthetic Rubber	71
Rural Drug Inspection Institutes	71
Foreign Cooperation in Petrochemical Industry	71
Petrochemical Industry Expects Expansion	72
Improvements in Medical Work Reported	72
Imported Electronic Products Inspection	72
Meteorological Satellite Launch Plans	73
Integrated Circuit Production	73
Electronics Leasing Company Established	73
Computer Technology Company Profits	73
Natural Science Foundation Financial Aid	74
Research Institutes Become More Self-Supporting	74
Tianjin Scientific Research Results Successful	74
Sichuan Technical Workers Help Boost Output	74
High-Tech Development Laboratories Planned	75
First Underwater Robot	75

#### PHYSICAL SCIENCES

Image Encryption Problems Discussed (Zhou Tongheng; JISUANJI YANJIU YU FAZHAN, No 5, 1986) ..	76
--------------------------------------------------------------------------------------------------	----

#### APPLIED SCIENCES

Nation's Largest Radio Telescope Installed in Shanghai (XINHUA, 11 Dec 86) .....	85
Tokamak Plasma Research Facility Passes Tests (XINHUA, 9 Jan 87) .....	86
Institute of Physics Discovers Superconducting Metal Oxide (XINHUA, 27 Dec 86) .....	87
Rigorous Mode Method for Studying Diffraction Properties of Optical Discs (Ruan Yu, Zhou Zhiping; ZHONGGUO JIGUANG, No 10, 20 Oct 86)	88
Beam Propagation Characteristics in Ring Resonators (Lu Baida, et al.; ZHONGGUO JIGUANG, No 10, 20 Oct 86) ..	88
Encoding of Pseudocolor Equidensities Using Combined Ronchi Gratings (Zhou Jin, et al.; ZHONGGUO JIGUANG, No 10, 20 Oct 86) ..	89
CW Ar <sup>+</sup> Laser Recrystallization of InP Films on SiO <sub>2</sub> (Lin Chenglu, et al.; ZHONGGUO JIGUANG, No 10, 20 Oct 86).	89
Forming Ring Profile Laser Beam and Its Application (He Hailin; ZHONGGUO JIGUANG, No 10, 20 Oct 86) .....	90

Dynamic Behavior of System With Delayed Feedback (Zhao Yong, et al.; WULI XUEBAO, No 9, Sep 86) .....	91
Stable Region of Tokamak Device Feedback Control (II). Experimental (Shen Zhongqing, et al.; WULI XUEBAO, No 9, Sep 86) .....	91
Experimental Studies of $F_3^+$ Color Centers in LiF Crystal (Zheng Lixing, et al.; WULI XUEBAO, No 9, Sep 86) .....	92
On the Aberration Theory for Wide and Narrow Electron Beams in Combined Electromagnetic Focusing Spherical Cathode Lens System (Ai Kecong, et al.; WULI XUEBAO, No 9, Sep 86) .....	92
Relativistic Aberration Theory for Combined Electromagnetic Focusing-Deflection System Possessing Spherical Cathode Lens (Ai Kecong, et al.; WULI XUEBAO, No 9, Sep 86) .....	93
Measurement of Some Level Widths in $^{40}\text{Ca}$ Between 9.5 and 10.5 meV (Gu Mu, et al.; WULI XUEBAO, No 9, Sep 86) .....	93
Effect of Flowing Plasma in Tokamak on Tearing Modes (Wang Maoquan; WULI XUEBAO, No 9, Sep 86) .....	94
Suppressing the Tearing Modes in Tokamak by Electron Cyclotron Resonance Heating (Wang Maoquan, et al.; WULI XUEBAO, No 9, Sep 86) .....	94
Interface Effect Between Different Phases in Process of Phase Separation and Crystallization of Amorphous $\text{Li}^+$ Conductor (Yu Wenhai, et al.; WULI XUEBAO, No 9, Sep 86) .....	95

#### LIFE SCIENCES

Suppressor Cell Function, Thymopeptide Therapy in Viral Hepatitis B (Zhang Dingfeng, et al.; CHINESE MEDICAL JOURNAL, No 10, Oct 86) .....	96
Briefs	
Zhejiang Fetus Electrocardiographs	104
Mediterranean Anemia Genes Identified	104

#### SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

Prominent Aerospace Personalities Introduced (HANGTIAN, No 5, 26 Sep 86) .....	105
-----------------------------------------------------------------------------------	-----

/9986

## NATIONAL DEVELOPMENTS

### FANG YI URGES SCIENCE, TECHNOLOGY REFORM

OW041001 Beijing XINHUA Domestic Service in Mandarin 1232 GMT 25 Dec 86

[By Meng Xiangjie]

[Text] Beijing, 25 Dec (XINHUA)--Addressing the opening meeting of the first plenary session of the State Natural Science Foundation today, State Councillor Fang Yi said: 1987 will be a very important year for deepening structural reform in science and technology. The State Natural Science Foundation should broaden its horizons and carry out its work creatively.

In his speech, Fang Yi first summarized the important progress made in scientific and technological structural reform. He said: Major steps have been taken in many respects in the 2 years since the central authorities decided to carry out structural reform in science and technology. They include reforming the system of appropriating funds for science and technology, exploring the technology market, expanding the decision-making powers of research institutes, promoting cooperation between research and production, strengthening the enterprises' capacity to absorb and develop technologies, reforming the system of administering specialized technological cadres, and inaugurating science foundations. These measures have produced results.

According to Fang Yi, next year's scientific and technological structural reform generally requires continuous efforts to consolidate, digest, supplement, and improve the results achieved and to take new measures to keep abreast of the development in China's reform and opening to the outside world. More flexible policies concerning research institutes and personnel should be adopted, and further steps should be taken to make technologies available to the market, promote the development of new technologies and industries, and train a new generation of entrepreneurs versed in science and technology as well as economic principles.

Touching on the launching of China's science foundations, Fang Yi pointed out: In accordance with the general blueprint for scientific and technological structural reform, the State Natural Science Foundation should, in the course of carrying out reform and opening to the outside world, gradually establish a sound science foundation system with Chinese characteristics. In addition to the limited funds appropriated by the state for science foundations, it



should seek and establish new fund-raising avenues, including government loans and private contributions. Contributions to science foundations by Chinese and foreign social groups, enterprises, and individuals should be given preferential treatment. Fang Yi urged planning, financial, tax, capital construction, and personnel departments to support the foundation's work.

Fang Yi also stressed the importance of basic research in China's economic, scientific, and social development.

Tang Aoqing, chairman of the State Natural Science Foundation, reviewed the work of the foundation this year and made arrangements for next year's tasks.

Song Jian, Yan Jici, Zhou Peiyuan, Lu Jiayi, Yan Dongsheng, and other leading comrades attended today's meeting.

/8309

CSO: 4008/2050

## NATIONAL DEVELOPMENTS

### REFORM OF SCIENTIFIC RESEARCH SYSTEM ANNOUNCED

OW051920 Beijing XINHUA in English 1615 GMT 5 Jan 87

[Text] Shenyang, January 5 (XINHUA)---The reform of China's scientific research system this year will be focused on adopting a more flexible policy on the management of research institutions and granting researchers a wider range of choices.

Zeng Xianlin, vice-minister of the State Science and Technology Commission, made the announcement at a seminar discussing reform of scientific research system.

The reform aims to change a situation that has produced research results which bear no relation to the needs of production, Zeng said.

To link research with production, most of the technology developing institutions, especially those engaging in the development of new product, will be gradually joined with enterprises or enterprise groups, and some will become service or technical development centers for different trades and regions.

Zeng said that the management and ownership of the research institutions should be gradually separated. The practice of renting, leasing, or contracting can be tried on small units with little capital and staff while big units should also try new ways of management, including contracting some sections to collectives or individuals.

Zeng said the reform aims at renovating the technology of big and medium-sized enterprises and enterprise groups.

A more flexible policy should also be adopted in the management of researchers, who should enjoy a more favorable and flexible environment to develop their skills and knowledge.

"They should be allowed and encouraged to go to small towns and rural areas, contracting or renting small enterprises, providing technical services, opening joint ventures, trading centers, or limited companies," said Zeng.

/8309

CSO: 4010/2006

## NATIONAL DEVELOPMENTS

### S&T RESEARCH FUNDING REFORM SEES INITIAL SUCCESS

OW041202 Beijing XINHUA Domestic Service in Chinese 0320 GMT 4 Feb 87

[Text] Beijing, 4 Feb (XINHUA)--China has accomplished preliminary successes in 1986 in reforming financing for scientific research. Following the reform accomplished by units directly affiliated with the State Council during the first half of 1986, scientific research organs in 38 provinces, autonomous regions, and municipalities directly under the central government, and provincial-level municipalities will soon finish categorizing their research projects. The Ministry of Finance has transferred most research funds to various scientific and technological commissions, which will provide the budgets for local research projects according to the new categorization.

Reform of the research funding system is an important part of reforming the entire appropriation system of financing scientific and technological research projects. In January 1986, the State Council promulgated provisional regulations governing allocation of funds for scientific and technological research, and decided to administer different types of research organs through different contractual systems and special funds. Funds formerly allocated to research organs by the Ministry of Finance according to the number of researchers will from now on be transferred to various scientific and technological commissions. The state will gradually reduce its financial support to research organs engaged in technical development so as to compel them to serve economic construction and earn their income from undertaking contracts from other regions and departments.

Commenting on the progress of reform, a leading member of the State Scientific and Technological Commission said that reform has brought about gratifying changes in scientific research organs, especially those engaged in technical development. Many units have come to realize that it is their responsibility to be concerned with economic construction and pay attention to economic benefits. Management of scientific and technological affairs is now openly conducted, and research units have also acquired greater decision-making authority. According to a survey conducted among the State Council's 400 or so research organs engaged in technical development, only 38 percent of their operation expenses in 1986 came from government appropriation, and 34 percent and 28 percent of their revenues respectively came from undertaking contracts of other regions and departments. Approximately 10 percent of central-level research organs engaged in technical development, have now become economically independent.

/6662

CSO: 4008/2058

## NATIONAL DEVELOPMENTS

### NATIONAL DEFENSE TECHNOLOGY DISCUSSED

Beijing BEIJING KEJI BAO in Chinese 13 Aug 86 p 1

[Text] In recent years, under the guidance of the party and the related state S&T policies, the NDSTIC, to realize the modernization of our national defense and accelerate the speed of national economic construction, has acquired obvious results and many other S&T results and has trained a great many talented people in S&T.

In conventional weaponry, they designed and manufactured successively a batch of new tanks, automatic guns, new rocket launchers, antitank missiles, warships, fighters, bombers, reconnaissance airplanes, radio-controlled and light aircraft, and some new electronic, communications, engineering, and chemical defense equipment which has strengthened our firepower, mobility, offensive capability, and speed of reaction.

In strategic weapons and space technology, following the successful 1980 launch of the missile in the Pacific, in October 1982 the launch of a missile from a submarine was also a success. And the research and manufacture work in strategic nuclear missiles has also made progress. The launch and recovery of the communication satellite succeeded. In 1984, the first communication and broadcast satellite reached orbit at 36,000 km and this year our communication and broadcast satellite settled in its orbit.

In the process of weapons research and manufacture, a great number of fine national defense S&T personnel were also cultivated. In the cities, the Gobi Desert, deep and mountains, and highlands, with simple and poor equipment and a lack of information, and through numerous experiments, they overcame several technological problems and successfully manufactured China's own atomic bomb, hydrogen bomb, missiles, and satellites and greatly strengthened our national defense.

Recently, the party Central Committee, the State Council, and the Central Military Commission made important decisions about the adjustment and reform of our national defense S&T industry. It should be put on the track of national economic construction and changed from serving the modernization of national defense to the construction of the four modernizations. They have already acquired obvious results in this aspect. Now the military engineering system has built more than 400 product lines of civil goods, developed more than 300 kinds of civil goods, and undertaken a great number of local S&T items. The gross output of civilian goods in 1985 is four times that of 1980.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### INTERVIEW WITH MILITARY INDUSTRIAL ACADEMY DIRECTOR

Beijing GUANGMING RIBAO in Chinese 3 Nov 86 p 2

[Report by Zhu Wenqin [2612 2429 3830]: "Military Industrial Academy Will Both Serve the Building of National Defenses and Also Will Serve Economic Construction"]

[Text] Zhu Hesun [2612 7729 1327]: chemical engineering specialist and professor. Graduated in 1951 from Dongwu College, and received an advanced degree from Zhejiang University in 1953. Went to Beijing Engineering Academy in 1955 as a teacher. In 1983 became assistant director of the chemical engineering department of the academy, and in 1984 accepted the appointment as academy director. Has been in the front lines of teaching and research for nearly 30 years, and in addition to teaching students in his discipline, has also trained graduate students and doctorate students. In the process of transmitting fields such as chemical engineering, solid state chemistry, and materials sciences, he has had research achievements in those fields. He has written more than 40 academic papers, and in 1985 received a second prize among national scientific and technical advances. He is currently engaged in research regarding aspects of plasma chemistry, as well as aspects of surface sciences.

In this new era of socialist modernization, how should military industrial institutions run their schools, and how should this develop? On one day in October, this reporter interviewed Zhu Hesun, the academy director of the Beijing Industrial Academy.

Director Zhu said, "As far as military industrial academies of the 1980's are concerned, we must implement the phrase 'shift' as in the principle 'guarantee completion of military tasks while shifting to the production of civilian goods' This will allow the schools to both serve the building of a national defense and also to serve national economic construction. To use one of our metaphors, we say that 'two wings fly together.' To this end, we must undertake reforms to strengthen our capacities to adapt and our competitive abilities."

The Beijing Industrial University was the first college of science and technology run by our party, having been established in 1940, in its former existence the Yen'an Academy of Natural Sciences. Among those who have been

its director are Li Fuchun [2621 1381 2504] and Xu Teli [1776 3676 4539], proletariat revolutionaries. In 1952 the name was changed to the Beijing Industrial University. To date, this major national university has trained more than 30,000 scientific and technical talents, who have made important contributions to our space efforts and to missile research.

Before the "cultural revolution," the Beijing Industrial University was a military industrial school that adopted strict measures of security. There were no signs at the school, and even student's classroom notebooks were collected daily and kept in safes. The majors and disciplines of the institution were all of a military industrial nature, so the adaptability of graduating students to society was rather narrow.

"For this reason," said Director Zhu, "there is great difficulty in the term 'shift' from the phrase 'guarantee the completion of military tasks while shifting to the production of civilian goods.' It is something of an ideological hindrance, and neither is it empirical. Especially for a group of middle-aged to older teachers, it is even more onerous, for whom no spirit short of 'burning your boats' is good enough. If the school is to survive and develop, we must resolutely implement the principle of 'shifting'."

Beginning in 1980, this academy gradually placed "guaranteeing the completion of military tasks while shifting to the production of civilian goods" onto the agenda of the reforms, and after many years of effort this academy underwent some fundamental changes. Now, this military industrial school has become a comprehensive higher institution with an emphasis on the industrial, with 16 departments and 33 majors in a combination of the natural sciences, engineering, management, and the cultural, which has made a gratifying pace in "running schools openly." In adjustments and reforms of the subject system and major structures, there were formerly 33 military-grade majors and majors that served military industry. Of those, 23 have been transformed into discipline majors, and 6 have been changed into majors that combine the military and civilian; at the same time, they added 3 majors in applied science and technology, and 9 new disciplines and cross disciplines. They set up a robotics research center and materials science research centers that break through the restraints of disciplines and majors. In addition, they will establish 4 more research centers of this type. The department of industrial design set up last year at the academy is a new major for training talent that overlaps both the two major disciplines of engineering and art. Adjustment and transformation of the curricula and specialties of the academy allow the military industrial specialties to be changed into specialties that emphasize general use and that combine military industry with general use; product type specialties have been changed into engineering and technology disciplines and specialties. The academy has established a 766 course curriculum for the 4,800 undergraduates, which is nearly twice that of 1979, and 85 percent and more of those are public, basic courses, and technology basic courses; for the 1,200 graduate students they have established a 209 course curriculum, with 203 research orientations. These breakthrough changes allow trained personnel to have solid theory, a firm foundation, and strong adaptability. This both serves the building of national defense and also can serve national economic construction.

Director Zhu said that for some years now, this academy has had no particular ties to the outside world, and it has been as if it were a fictitious land of peace situated on the outskirts of Beijing. In the change from a closed model to an open one, the academy is facing up to running a school in society, which has enhanced its relations with society. It is running a night college and correspondence courses, it has set up 63 correspondence stations in 17 provinces, municipalities, and autonomous regions throughout the country, and has founded 3 branch academies in Beijing to train specialist talent for local areas and enterprises. Laboratories at the school have opened up in serving society, and over the last few years have taken on the tasking of testing, verifying, and processing products for more than 200 factories and enterprises. Director Zhu told this reporter quite happily that "We feel that the more we run the school openly, the broader it gets. There have been improvements in the quality of teaching, and our science research achievements have played important roles in the four modernizations. Over the past few years, this academy has won 17 national prizes for invention and awards for national science and technology advancement, 33 national science foundation awards, and 111 national major technology transformation awards. In summary, it is my understanding that if this military industrial academy is to develop, we must run the school in keeping with the four modernizations, we must work toward integration of the military with the civilian, and strengthen our own capabilities for adaptation."

12586

CSO: 4008/2040

## NATIONAL DEVELOPMENTS

### POTENTIAL FOR EXPORTING TECHNOLOGY DISCUSSED

#### Examples Cited

Tianjin JISHU SHICHANG BAO in Chinese 5 Aug 86 p 1

[Text] At present, as one topic in foreign trade, technology exports from our country have shown potential. Within 1 year, 12 technology export contracts have been approved by the Ministry of Economics and Trade which amount to \$7.6 million. These export items are mainly in the fields of medicine, electronics, chemical engineering, and metallurgy and the importing countries are mainly Japan, the United States, Switzerland, Italy, and Sweden. These technologies were welcome after their export.

Practice has indicated that our technology has great potential for export; we have both the mature industrial technologies which are appropriate for the developing countries and new inventions and S&T results with promising prospects for markets in the developed countries. Last year and this year, at technology fairs in the United States, Switzerland, Yugoslavia, and Japan, our technology received attention and favorable comments.

The two-stage fermentation technology for vitamin C exported to the Hoffman-LaRouch Company, Switzerland, replaces the ketonization and the chemical oxidization with biological oxidization (fermentation), through double fermentation, which reduced the links in its production, saved chemical materials, and reduced costs, and is an innovation in vitamin C manufacturing technology. Another example is the advanced product KTP (potassium titanium oxide phosphoric acid) sample exported to Japanese Vacuum Technology, Ltd., from Shandong University, which was tested by that company and rated as superior in some of the qualities to that produced in the United States. The KTP crystal can be widely used in various lasers, for eye operations, or in laser printers which greatly reduce the size of the laser. Our capability to produce KTP indicates that in some areas of S&T research we have arrived at the international standard and our high technology will have a wide market in the world.

To strengthen the management of technology exports, the Ministry of Foreign Trade last year established a special department with staff in charge of export work. They are trying to recommend, through different channels, marketable technology items and some of them have caught the attention of



foreign customers who are making further contacts. The Economic and Trade Ministry decided to establish a technology export pavilion at the Guangzhou trade fair this fall to be used as a window to propagate our technology and provide information for foreign customers, with plans in the future to join select foreign technology fairs and exhibitions of greater influence and also organize some technology export delegations.

#### Commentary on Technology Exports

Tianjin JISHU SHICHANG BAO in Chinese 5 Aug 86 p 1

[Text] In recent years, China, while implementing opening up to the outside and introducing technology, also exports technology. The exportable-technology resources in our country are wide in scope and have great potential, but at present, it is in the initial stages and we lack specific procedures. From a macroscopic point of view, in export technology, we must consider the overall interest without being one-sided to raise the economic results. For this reason, it is important to pay attention to the integration of the following:

1. Integration of technology and product exportation. Up to now, there is no international definition for technology commodities. The United Nations Trade Organization thinks it has the systematic knowledge to manufacture a product, apply some technology, or offer some service. Some compare equipment to "hardware" and the others, such as patent, technology, and information, to "software." Offering some software to someone else often implies cultivating a rival to compete against oneself. So technology-exporting countries are very careful to export pure software, especially in high-technology exports, which can never be taken lightly. Pure software export is done only in some special situations. Shaanxi Hu County exported 4,000 kg of sweet melons and seeds to the United States in the past few years, and acquired an income of nearly 270,000 RMB, and the United States was very much satisfied. In international technology trade, the export side always tries to sell their hardware. So we must have the relation between the exported technology and the product well handled and do our best to integrate the two together.

2. Integration of export technology and labor. In general, labor in technology trade refers to providing the technology receiver with a technology force in order to proceed with engineering design, construction, installation, checks and acceptance, test runs, and technological training. The labor service of our country has been welcomed by many countries. Examples are the design, construction, and operation of marsh gas pools, underground warehouses, and small hydropower plant water turbine pumps with which we have whole sets of experience and whose characteristics suit the local conditions. When they were exported to the developing countries such as Southeast Asia, the Middle East, and Africa, labor service was also provided, which was welcome. Besides pure labor, labor export offers materialized labor and its scope can be expanded to include contract engineering construction in foreign countries. This is very common in international technology trade. It needs a great amount of work and abundant professional strength, stronger material foundation, and strong management.

3. Integration of export technology and cooperation development. Technology export with labor consists mainly of industrial technology, and technology combined with cooperative development is mainly laboratory technology. With this kind of technology, owing to its limited maturity, its economic value is hard to assess; therefore, it should be handled with great care. Those with conditions in the country should be developed in the country. Our country has certain superiorities in medical technology, such as anticancer drugs and a medicine to cure brain blood vessel blockage, but it is not easy for traditional medicine to enter the international market, so in exporting this kind of technology, it is more proper to adopt the "cooperative development" method. Under the principle of equality and mutual benefit, we can draw on the strength of each to offset the weakness of the other to accelerate the development of that technology to serve the people of the world.

4. Integration of technology exports with technology imports. The international technology market is not unidirectional and where there is an inlet there must be an outlet. We can perfectly utilize our technology superiority, in a larger scope, and choose the appropriate and needed technology for imports. With some we can use our technological superiority as a "bargaining chip" to acquire foreign technology which is restricted or which they are unwilling to offer.

5. Integration of technology exports with foreign patent applications. A patent application is of concern to both the licensor and the licensee. The United States, Japan, and Luxemburg, after importing our technology, all applied quickly for patents. In the signing of the license grant, we always specify that the patent belongs to our side and the license will finish the patent application. It is reasonable to do this when we lack the experience or conditions; yet, it runs the risk of revealing the secret of the technology. Now our country has implemented the patent system, and in the future, applying for patents in a foreign country can be done according to the law, through some organization or agency in the foreign country. Patents can raise prestige and strengthen one's potential in negotiation, but not all technology needs a patent. In general, it is appropriate to apply for a patent when the technology is more advanced than similar technology in a foreign country and has great potential in the international market or is difficult to put into practice, only being dependent on the literature of the patent. It is not appropriate to apply for a patent for those technologies whose use is limited in the factory or workplace and hard to be encroached upon. To decide whether to apply for a patent or not and when, we need a feasibility study.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### MACHINERY INDUSTRY TO IMPORT ADVANCED TECHNOLOGY ITEMS

Beijing ZHONGGUO JIXIE BAO in Chinese 14 Aug 86 p 1

[Text] This correspondent learned from the related departments of the Ministry of Machine Building that during the Seventh 5-Year Plan the machine engineering industry will completely digest and absorb the 800 items of technology already introduced and introduce another 800 advanced-technology items, establish 50-100 joint-venture or cooperative enterprises and foreign enterprises, and strive for the establishment of 10 enterprises in foreign countries. This is the principal task of the machine engineering industry in using foreign capital and introducing technology during the Seventh 5-Year Plan.

During the Sixth 5-Year Plan, through trade permission cooperative production, technical consultation, and cooperative research and foreign investment, 800 items of technology were introduced cumulatively, and after their digestion and mastery, the utilization of this technology covers technologically 6,000 items, which amount to 12 percent of the current categories of the ministry.

During the Seventh 5-Year Plan, in technology introduction, the machine-building industry put the emphasis on large sets of equipment, products which can earn foreign exchange, machine tools, basic parts and components, energy-saving product software, and key items of equipment. On the basis of the items introduced during the Sixth 5-Year Plan, it will supply the deficiencies, put into sets, pay attention to key technology, skills, sets, and special materials, especially key parts and technology needed in the unification of machinery, electricity, and instruments, to maintain the progress of the industry and raise the result of the technology introduced.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### TECHNOLOGY IMPORTS SITUATION DISCUSSED

Tianjin JISHU SHICHANG BAO in Chinese 29 Jul 86 p 1

[Text] The situation in technology introduction in the first half of 1986 is fine. The number of contracts approved by the Ministry of Economics and Trade and by organizations assigned by that ministry to examine technology introduction has reached 476, which amounts to U.S.\$1,475,660,000, with a 49.2 percent increase, compared with the number of contracts approved in the same period last year, which amounted to U.S.\$2,047,350,000, with a 27.9 percent decrease.

In the first half of this year, the contracts signed with foreign companies have a broader scope in the technology introduced and a greater number in classification. They are mainly in energy, electronics, mechanical engineering, petroleum, chemical engineering, metallurgy, and light textiles. Among these technology introduction contracts, 50 percent are for licensing agreements and for consultation and technology services.

There are several characteristics of the technology introduction contracts approved this first half-year: First is the rise in the number of contracts signed while the total amount of money dropped. The second is the rise in the level of the technology introduced. In the first half of the year, among the contracts, the proportion of technology costs had an obvious rise, which is a good sign. Though it stands at only 16.8 percent of the total, yet in the 65 contracts from the Ministry of Machine Building, the technology cost is 71.3 percent; in the 26 contracts from the Electronics Ministry, technology costs stand at 48 percent; in the 15 contracts from the Petroleum Ministry, 41 percent; in the 5 contracts from the National Science Committee, 74.2 percent; and in the 7 contracts from the Aviation Ministry, 100 percent. The third characteristic is the improvement in technology introduction in the remote and inland provinces. Starting last year, Inner Mongolia, Yunnan, Guizhou, Shanxi, and Shaanxi all introduced some technology. Twelve items were introduced in the first half of the year. The fourth characteristic is that the emphases of technology introduction continue to shift gradually from Japan and the United States to Europe. This year the number of contracts signed with the Common Market reached 92, a number which occupies first place. Among them, 69 contracts were signed with West Germany, which amounts to \$86,135,000, and 25 contracts with England, which amounts to \$28,651,000. Technology cooperation with Russia and East European countries has expanded.

Six items of technology were introduced from East Germany, two items from Yugoslavia, and two from Poland, for a total of \$30,368,000. Cooperation items with Russia are opening up. The fifth is the continuous strengthening in the work of coordinating foreign oriented projects. Last year, too many units negotiated with foreign countries, which caused much duplication. This year the related departments emphasize coordination among many contracts. For example, the industrial departments coordinated with the economic and trade departments in the introduction of color TV tubes, tape recorders, and glazed pile production lines to organize them and avoid duplication and assigned one company to negotiate to strengthen their position. This method was highly praised.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### JOINT VENTURES IN HEALTH CARE

#### Cui Yueli on Sino-Foreign Cooperation

OW091928 Beijing XINHUA in English 1731 GMT 9 Jan 87

[Text] Beijing, 9 January (XINHUA)--China has trained some 100 acupuncture and moxibustion doctors of primary and secondary levels from 14 developing countries, said Cui Yueli, minister of the public health.

The Minister said at today's national meeting for heads of the provincial public health bureaus that last year China sent 875 students to further their studies and research abroad and signed 14 important contracts for cooperation.

He added that China sealed an agreement with Japan which will provide over 2 billion Japanese yen for scholarships for 1,000 Chinese students over the next decade.

The Minister said China has also hosted two international medical symposiums. The government has also sent experts of Chinese medicine to Japan, United Arab Emirates, Colombia, Mexico, Tunisia and other countries, for lectures and to offer technical guidance on acupuncture and moxibustion.

#### Pharmaceutical Industry Cooperation

Beijing XINHUA in English 1118 GMT 10 Jan 87

[Text] Beijing, 10 January (XINHUA)--China's pharmaceutical industry will expand its cooperation with foreign countries to attract more funds and new technology in 1987, the overseas edition of the PEOPLE'S DAILY reported today.

Quoting Qi Moujia, director of the State Pharmaceutical Administration, the paper said the industry will develop a number of patent Chinese medicines for common diseases, enhancing intelligence, body strength and prolonging life, and several chemical medicines up to the advanced world level. The industry will also pay attention to the research of new medical electronic instruments.

In 1986, it imported 35 items of technology from abroad and entered into cooperation in a number of joint ventures with foreign businesses. The value of exported medical products was 600 million U.S. dollars last year, 15 percent more than in 1985.

Among the exports was fermentation technology for vitamin C production. The industry has established ties with 100 enterprises in 50 countries.

/12858

CSO: 4010/1016

## NATIONAL DEVELOPMENTS

### FOCUS ON TRADITIONAL HEALTH MEASURES

#### 200 Traditional Medicine Hospitals Planned

OW101708 Beijing XINHUA in English 1522 GMT 10 Jan 87

[Text] Beijing, 10 January (XINHUA)--China is expected to build 200 hospitals specializing in traditional Chinese medicine and 19,000 beds this year, a leading official of the State Administration Bureau of Traditional Chinese Medicine said today.

Hu Ximing, director of the Administration Bureau, said each county in Heilongjiang, Jilin, Liaoning and Jiangsu provinces now has a traditional Chinese medicine hospital. This year, Hu said, the Ministry of Public Health requires another six or seven provinces to match that standard.

He said his bureau has taken several measures to improve the medical services of traditional Chinese medicine. "These measures allow doctors to open sparetime clinics and receive reasonable pay, encourage collective or private hospitals or clinics and persuade more doctors to be apprentices of experienced doctors of traditional Chinese medicine," he said.

Meanwhile, China will also make great efforts to improve medical services in rural areas, according to Cui Yueli, minister of public health. Speaking at a national medical conference closed yesterday, Cui said "more rural hospitals at the town level will be contracted or leased to a group or individual doctors or medical workers in a bid to improve service."

"Departments specializing in treatment of certain diseases should be established in rural hospitals to free peasants from travelling a long way for medical treatment which costs a lot," Cui said.

#### More Demand for Herb Medicines

OW101715 Beijing XINHUA in English 1536 GMT 10 Jan 87

[Text] Beijing, 10 January (XINHUA)--While use of Western medicine is on the increase, Chinese people are also demanding more traditional herb medicines, an official said here today.



Zhang Honggui, manager of China Crude Drugs Company, said, "China sold 5 billion yuan worth of Chinese herbal medicines in 1986, up 13 percent over the previous year." He said that China also exported 219 million yuan worth of traditional herbal medicine last year, 20 percent more than the previous year.

"The Chinese traditional herbal medicines are getting more and more popular in Southeast Asian and European countries," he added. An increase of 3.3 percent was registered in production of 20 main products such as ginseng, Chinese angelica and tremella, totalling 97.5 million kilograms.

Zhang Honggui said, "Chinese traditional medicine producers basically meet the needs of Chinese citizens and exports."

In order to expand production, he said, China will encourage enterprises to produce more medicines that are badly needed while importing technology and equipment for larger scale production for export.

#### Qinghai Researches Mongolian, Tibetan Medicine

OW240101 Beijing XINHUA in English 1837 GMT 23 Jan 87

[Text] Xining, 23 January (XINHUA)--Traditional Tibetan and Mongolian medicine has made great achievements in northwest China's Qinghai Province, where large numbers of those ethnic groups live.

The province has set up a Tibetan Medicine Research Institute and 23 Tibetan and Mongolian medicine hospitals staffed with 960 doctors and nurses. They treat 200,000 patients annually.

The Tibetan medicine bath is a typical treatment. The Provincial Tibetan Medicine Hospital and the Huangzhong County Tibetan Medicine Hospital have received thousands of domestic and overseas patients since they opened medicine-bath clinics in 1983.

The province invested 170,000 yuan last year to build another two medicine-bath clinics.

Meanwhile, the provincial government has also sent doctors to the Tibet Autonomous Region and other provinces to study Tibetan medicine. Over the past three years, more than 150 doctors specializing in Tibetan medicine have been trained.

In addition, some Tibetan medical schools have been reopened in 38 monasteries in the province.

## More Traditional Doctors To Be Trained

OW291850 Beijing XINHUA in English 1447 GMT 29 Jan 87

[Text] Beijing, 29 January (XINHUA)--China will train more doctors in traditional Chinese medicine to continue and promote the valuable science, a senior Chinese official announced today.

"The ancient tradition is facing many problems," Hu Ximing, vice-minister of the Ministry of Public Health told reporters, "and the biggest is the lack of qualified personnel."

"The key to developing traditional Chinese medicine lies in training enough personnel at all levels," the vice-minister pointed out.

During the Seventh Five-Year Plan period (1986-90), each province with no school of traditional Chinese medicine is requested to build two or three.

Existing schools and institutes are requested to increase enrollment and develop more comprehensive curriculums in traditional Chinese medicine, acupuncture, moxibustion, orthopedics, massage and nursing, Hu said.

Two hundred county hospitals of traditional Chinese medicine with a total of 19,000 accommodations will be built this year, in addition to the existing 1,100 ones, and hospitals will also be set up in regions inhabited by China's ethnic minority groups, the senior official added.

/12858

CSO: 4010/1016

## NATIONAL DEVELOPMENTS

### NEW MEASURES IN DOMESTIC HEALTH CARE

#### Measures To Encourage Private Health Care

HK080404 Beijing CHINA DAILY in English 8 Jan 87 p 3

[By staff reporter Nie Lisheng]

[Text] The Ministry of Public Health has decided to let private doctors own their own pharmacies and open joint clinics or hospitals using pooled funds.

In 1986, the number of private practitioners increased to 126,700, up from 116,900 in 1985, CHINA DAILY learned yesterday from a national conference on public health now in session in Beijing. They now own a total of 700 treatment beds.

This year, the Ministry will give more support to private medical businesses to ensure that the number of practitioners will rise by no less than 6.9 percent to more than 135,400.

All retired medical workers or those waiting for jobs may practice medicine on their own with the approval of State health administration departments at county level or above. The departments will check on their professional background and their medical facilities to make sure they are up to standard.

As incentive measures, the practitioners will be permitted to keep their own pharmacies and charge their patients higher prices for consultancy and prescriptions.

They will also be encouraged to set up clinics and hospitals through joint ventures and on a voluntary basis, the ministry said in a work plan report for the Seventh Five-Year Plan (1986-90). In urban areas, special emphasis will be laid on developing small, specialized private clinics where State-run hospitals still cannot provide adequate services.

Under the planned measures, State medical workers will be allowed to take on part-time jobs and to earn a reasonable wage for their extra services. They are also being encouraged to visit elderly and infirm patients at their homes.

According to a recent survey by the ministry, the number of licensed private practitioners has increased from 80,000 in 1984 to nearly 130,000 last year.

Sichuan Province, for example, has nearly 100,000 private medics, more than any other part of the country. Fujian Province ranks second with more than 5,000 practitioners. The sharp increase in the last three years is partly the result of a growing number of older State medical workers who still want to use their expertise after retirement.

Most of the practitioners are engaged in traditional Chinese medicine, denistry, gynaecology, and pediatrics. In Tianjin, for instance, half of the city's 700 private doctors practice traditional Chinese medicine such as herbal treatment, acupuncture and massage.

The majority of practitioners in Tianjin use their own homes as clinics by putting up a signboard near the doors, although some of them have jointly expanded their businesses into small hospitals.

In Guangdong Province, about 10 percent of the patients treated each year now see private practitioners, even though they account for no more than 5 percent of the province's medical workers. In Beijing, some 1,500 private doctors saw more than 1.3 million patients in 1986, the equivalent capacity of two large city hospitals.

#### Cui Yueli Speaks on Medical System Reform

OW091924 Beijing XINHUA in English 1726 GMT 9 Jan 87

[Text] Beijing, 9 January (XINHUA)--China's current medical system has already undergone reform with more individuals and collectives running their own hospitals and clinics both in the city and rural areas, a government official said here today.

Speaking at the National Conference of the Provincial Directors in Charge of the Public Health Work, Cui Yueli, minister of the public health, said that along with the development of the rural commercial economy, the medical field also needs reform to meet the demands of the Chinese people.

According to Cui, China's hospitals at or above the county level see 2.5 billion patients annually. Fifty million people are hospitalized each year. "However," he said, "the present medical establishment is far from sufficient to satisfy patients."

In order to fully tap medical workers' initiative and enthusiasm, many county hospitals have been contracted or leased to individual doctors or medical workers, Cui said. According to Cui, there are 120,000 such doctors and medical workers in the country.

Specialized clinics or hospitals have also been set up with Shangxi Province leading the trend with 413 such hospitals. Also, more and more hospitals have begun to cooperate with other hospitals attached to enterprises or the army, Cui said.

The local governments have also improved the medical system by raising more funds from collectives and individuals. Sichuan Province has raised 58 million yuan for its county hospitals; and Guangzhou medical units have raised materials and funds worth 30 million yuan from foreign communities, friends and overseas Chinese, according to Cui.

/12858

CSO: 4010/1016

## NATIONAL DEVELOPMENTS

### STATE CLIMATOLOGY COMMISSION FORMALLY ESTABLISHED

OW051128 Beijing XINHUA in English 1110 GMT 5 Feb 87

[Text] Beijing, February 5 (XINHUA)--The State Climatology Commission of China was set up in the Beijing Meteorological Center today.

Song Jian, state councillor and minister in charge of the State Science and Technology Commission, said, "This institution will establish close relations with its international counterparts. It will organize Chinese scientists to take an active part in international cooperation and make contributions to worldwide climatological research."

He added, "It will also organize meteorologists and climatologists to make joint efforts to study and solve meteorological and climatological problems connected with China's economic construction and social development."

The commission is composed of specialists from 13 departments and includes subcommittees on materials, research, application, etc.

Zou Jingmeng, director of the State Meteorological Administration, is the chairman of the commission.

/6662

CSO: 4010/30

## NATIONAL DEVELOPMENTS

### IMPROVED METEOROLOGICAL SYSTEM PROVIDES BETTER FORECASTS

OW020932 Beijing XINHUA in English 0902 GMT 2 Feb 87

[Text] Beijing, 2 Feb (XINHUA)--China will set up a mid-range meteorological system, capable of giving 5-day weather forecasts, by introducing sophisticated computers and launching a meteorological satellite before 1990, the overseas edition of the PEOPLE'S DAILY reported today.

An atmosphere detection network involving air and ground stations has been formed in China. The accuracy of short-range weather forecast has been improved, the paper said.

To upgrade its capacity, the meteorological authorities decided to use big computers, which are able to process over 100 million pieces of information a second.

The paper reported that the country will also launch a weather satellite and establish six regional meteorological centers to further develop the conventional monitoring and detection system.

The layout of meteorological radars will be readjusted to establish a batch of automatic weather stations on islands, plateaus and deserts.

Meteorological authorities will also provide special services for marine production, prospecting of coastal areas and harbors.

/6662

CSO: 4010/30

## NATIONAL DEVELOPMENTS

### GUILTY VERDICT DAMPENS TECHNICAL CONSULTING ACTIVITIES

Beijing GUANGMING RIBAO in Chinese 3 Dec 86 p 1

[Report by Sang Heng [2718 5899]: "Engineer Huang Daosheng Sentenced to 2 Years for Contract; S&T Circles Respond that Ardent Enthusiasm Will Be Greatly Harmed"]

[Text] At the recently convened 3d Congress of the Shanxi Province Science Association, the case of engineer Huang Daosheng [7806 6670 3932], who had been sentenced because of contract consulting services, brought a response. During the period of 1984-1985, engineer Huang Daosheng of the Shanxi Province geology contingent No 212 and the geology group that he led received an invitation from the Zhaozhuang coal mine in Pingding County to do prospecting consulting. In accordance with a bipartisan agreement, after the tasking was completed ahead of time in February of last year, the mine gave to the geology group a total of 4,500 yuan for bonuses, overtime wages, and living allowances. Huang's own share was 760 yuan. The rear geology contingent discipline inspection committee reported this affair to the Gaoping County Procuratorate, and after public prosecution, the court decided that Huang had been corrupt. In addition, that in the contract process the accountant of the geology group, Yuan Yanhua [5913 3508 5478], had embezzled more than 3,000 yuan from fraudulent receipts. When that case had been exposed, on the condition that Huang had once signed his name on a receipt, it was determined that Huang had taken half of that. The county court only heard a statement from one side, but also determined that Huang had embezzled more than 1,000 yuan, for a total share of the embezzled funds of 2,157.86, for which he was sentenced to 2 years. Huang has never admitted to this.

Recently, the Southeast Shanxi branch of the Shanxi Province Geological Society reported this affair to higher authorities, and Shanxi municipal science associations immediately made a detailed investigation. It is their belief that Huang Daosheng and comrades of the geology group had found coal for more than 30 small mines in Gaoping County in recent years, and have made great contributions to town and township enterprises. Huang has always been diligent and conscientious in his work, working until the very last possible day to complete a contract before leaving the field. The allowances and bonuses they received were legal, and that idea that "any income outside of wages is illegal" is incorrect. In December of last year, regarding the so-called "illicit funds" that the geology contingent had not received, the



county procuratorate proclaimed that "if the money were not handed over before 10 pm that evening, the persons would be taken away." They threatened and intimidated, and forced over more than 10,000 yuan of the compensation for overtime from 19 comrades who had never been part of the dealings, and the reaction to this was quite bad. When the case was finally decided, it was still not explained what the nature of this money was, but neither was it returned. In addition, regarding the bonuses obtained by the Huang Daosheng group, it was also suspected that the mine director of the Zhaozhuang mine, Chen Zhong [7115 0022] (engineer), had a hand in the matter and took a share. Without proof, the county procuratorate made the written suggestion that Chen be punished, even that Comrade Chen Zhong be investigated over the period from June last year to the present. The question of becoming a full member after his probationary party membership could also not be decided in due time, and his work has suffered. Regarding another sum of money, on the sole basis of work related signatures it was determined that there was insufficient evidence that half had been embezzled. There have been strong reactions toward this affair among science and technology personnel. When the science association again organized consulting activities, no one dared to participate. The geology contingent also dared not serve again in the area. When the year before last the science and technology personnel from the geology contingent, with the exception of a small number of the old and sick, did consulting in the area, the contingent income was more than 500,000 yuan, last year it was more than 700,000 yuan, and although it is now November, income is yet to reach 50,000 yuan. Public reaction to this case has been that the geology contingent discipline committee had nothing better to do and that the county court got involved in something that was none of their business.

After Comrade Cui Guangzu [1508 0342 4371], secretary of the Shanxi municipal commission, received the report of the science association he hoped to reopen the case. Recently, he emphasized again at the science association congress that scientists and technicians rely upon their intelligence and hard work to serve production. It is both right and legal that they should obtain compensation for this. In all of our cities, there are more than 20,000 town and township enterprises now worried that no technical personnel will dare to be contracted. We should create a broad, relaxed environment in which they can courageously do their work.

12586

CSO: 4008/2040

## NATIONAL DEVELOPMENTS

### TECHNICAL EXPERTS URGED TO WORK IN UNDERDEVELOPED AREAS

OW281220 Beijing XINHUA in English 0907 GMT 28 Dec 86

[Text] Beijing, December 28 (XINHUA)--China is to try out a new policy to encourage scientists and technicians to go to the poor areas to alleviate the acute shortage of technical personnel there, according to Guo Shuyan, vice-minister of the State Science and Technology Commission [SSTC].

He said that the SSTC encouraged units overstaffed with technical people to organize scientists and technicians to contract for or lease industrial enterprises in poverty-stricken areas or take up leading posts at medium-sized and small enterprises and township factories and to take charge of technology development, technical consultancy and training.

Units which send personnel to poor areas are allowed to become shareholders in local factories with their technology, equipment and funds and get dividends and share risks.

Scientists and technicians are also encouraged to be transferred to poor rural areas or resign from their original posts or have their wages stopped but original posts retained while they run or manage technical development or trade agencies or start new enterprises in those areas.

Favorable remuneration will be granted to those scientists and technicians who create wealth for the people in the poor regions. They can get dividends for their technology and the income will not be limited to their original wages.

When they leave their original jobs, their families may stay where they are and their work age in rural areas will be counted and their achievements will be an important consideration in their promotion and in receiving academic titles.

The policy will be first tried out in the Dabie mountain area in western Anhui Province, where agricultural technicians number only three for every 10,000 people and each takes charge of 400 hectares of fields or 6,700 hectares of forests.

/8309

CSO: 4010/2006

## NATIONAL DEVELOPMENTS

### CAS LEADER SPEAKS ON REFORM

Beijing RENMIN RIBAO in Chinese 21 Aug 86 p 3

[Text] Chinese Academy of Sciences [CAS] Deputy Director Zhou Guangzhao [0719 0342 0664] pointed out several times recently that people regard CAS as an organization which belongs to the people who staff it and this does not accord with the aim of the founding of the Chinese Academy of Sciences. The institutes and branches of CAS should be joined and managed by the finest scientists in our country and S&T research equipment should be kept open to them.

Zhou said that in the future CAS should be an institute for all scientists of our country. The great amount of S&T research equipment bought with the best efforts of the state cannot provide convenience for the people in CAS only, but should be enjoyed by all the scientists in the country. Its management should gradually be turned over to the finest scientists in our country. For CAS's high-energy physics laboratory a management committee should be established very soon. Presidents from some universities, related specialists, and the director of that laboratory and specialists should come together to organize a control committee, which will study and decide the direction and research topics of the laboratory. He said that in the United States, the management committee of the Fermi lab is composed of 16 university presidents, and the director of the laboratory, chosen from the whole country, is now a professor from Columbia University. A high-energy particle accelerator, the only one in our country, is being built at CAS, which is used not only for high energy itself but also for research on synchronized radiation. It may have important effects on research in chemistry, biology, and microelectronics technology. Therefore, it ought to be a national laboratory and should be managed by the related scientists of our country.

This open-minded and intellectually dynamic theoretical physicist, since he became a deputy of CAS, has been with the other leading cadres in the implementation of the S&T system reform and S&T research administrative reform. He first proposed to establish the rotating postdoctorate posts and to open up a group of CAS institutes and branches in the country. Not long ago, with the leaders of Beijing University and Qinghua University, he suggested to the authorities that the tie between CAS and the universities and colleges be strengthened. He said that CAS can cooperate with some universities to establish research stations which can put up the CAS sign and be administered and supported by the local university and CAS.

Zhou also thinks that whether a university or a research institute, it should be an open one, and their personnel should be able to flow. He said that we should regard the striving of Beijing University and Qinghua to first-class universities in the world as everybody's business. The current concept is that the people at Beijing University care only about Beijing University and those at CAS care only about CAS, which is not good. He said that some of the current science and education systems are not scientific enough. There are many talented people and much fine equipment at the universities, S&T research units, and even factories and enterprises; nevertheless, they are not concentrated, not formed into sets, and are too scattered. Thus no strong force can be formed. So it is difficult to expect any comprehensive and important results from them, or to proceed with the most modern and advanced scientific study. We should also create a working environment to let the scientists in our country work in a more open, cooperative, and exchanging atmosphere. Thus talent will emerge soon, and S&T will improve soon. He hopes that through 10 to 15 years of effort, there will be great changes in the system and in concept also.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### TRENDS IN BASIC SCIENCES DISCUSSED

Beijing BEIJING KEJI BAO in Chinese 16 Jul 86 p 4

[Text] Since 1979, our country has been first in the speed of development of the basic sciences.

1. According to the number of academic papers written by scholars in our country and published in the leading periodicals in the world, our country stood in 38th place in 1979, and jumped to 13th place in 1982, with an average rate of progress of 62.13 percent per year.
2. In the development of the basic sciences in our country, there is an imbalance among the different disciplines. The development of chemistry is the fastest; the rate of growth of academic papers in chemistry had an average of 329.54 percent per year; next is mathematics with a growth rate of 177.3 percent; and the third is physics with a rate of 107.74 percent.
3. Mathematics in our country has the greatest influence on the quality of the theses in the world. If the influence of mathematics of each country is arranged in order, mathematics in our country has risen from the 35th position in 1979 to the 18th in 1982, an average of 5-6 positions upward.

Looking at the development of the basic sciences from the angle of scientific statistics, the following conclusion may be arrived at: First, despite the position of our basic sciences still climbing up to 1985, our progress is behind that of India, Japan, and Israel. Therefore, in our S&T strategy, we should never neglect due proportion on basic sciences in our current S&T structure. Second, the growth in the number of scientific papers in our country is fast, yet the quality needs to be improved. To strengthen international exchange and cooperation in the basic sciences should be our strategy from now on. Third, the discipline structure of our basic sciences is not rational. To adjust the discipline structure in our basic sciences is one of the important contents of S&T research system reform.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### XINJIANG CAS SUPPORT OF APPLIED RESEARCH DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 30 Aug 86 p 4

[Text] The research units in the Chinese Academy of Sciences' [CAS] Xinjiang branch all insist on the principle of putting the emphasis on applied research and paying attention to the current and future construction of the autonomous region, and they have become a group of important S&T pioneers in the development of the great northwest of our mother country.

Under the Xinjiang branch, there are the 4 institutes of physics, chemistry, desert soil biology, and geography and 1 satellite-tracking station, which have nearly 700 S&T personnel from all nationalities. In recent years, in stressing the applied-research policy of the central government, they have used more than 70 percent of their projects to serve directly the development of Xinjiang and to raise the standard of the economic and social results of S&T work and academic levels at the same time.

The institutes of the Xinjiang branch started work in three areas. The first was to reorganize a comprehensive investigation to have a clear understanding of "the property" of the autonomous region; second, it was to transform the natural conditions of sand blown by wind, saline-alkali land, drought, and disaster caused by snow and to improve agricultural and husbandry production; and the third was to popularize new technology in applied biology, materials, computers, and radiation and raise the level of national economic growth in the autonomous region.

The institutes of geography and desert soil biology finished successively "the investigation of the resources in the wasteland of some key points in Xinjiang" and "the scientific investigation of the Lop Nor region" and made important improvements in "the plan of redistricting Bayangol Mogol autonomous prefecture" and "the overall planning of the Altay region." The results of the investigation and understanding of the S&T personnel have become an important basis for the formulation of the development plans of the autonomous region.

S&T personnel from the physics and chemistry institutes utilized new technologies and solved problems such as a new enzyme for fur softening, preventive measures for Hami melon disease, chemical pressurization techniques in deep oil exploration, spectroscopic analysis of rocks using computers,

radiation chamber rock coloration, and fruit preservation, which have achieved obvious economic results.

At present, S&T personnel in the Xinjiang branch are combining and carrying out the Seventh 5-Year Plan and are taking the initiative to undertake the important tasks of the comprehensive S&T mission in the early preparation work of Xinjiang's development and the crucial S&T work to raise production.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### NECESSARY CONDITIONS FOR SOFT SCIENCE DISCUSSED

Beijing RENMIN RIBAO in Chinese 24 Aug 86 p 3

[Text] The National Soft Science Forum has just ended. Hu Ping [5170 1627], director of the Chinese S&T Promotion Research Center, said that for the further development of soft science in our country, there must be a breakthrough in our concept to eliminate some obstacles and create an environment with a high level of political democracy and academic freedom.

The Chinese S&T Promotion Research Center is a comprehensive research unit directly under the National Science Commission. Since its founding in October 1982, its main work is the research of some topics in soft science such as a national first-level S&T development strategy, principles, policy, management and technology assessment, and consultation for the National Science Commission on important decisions and also its offering of suggestions for national S&T, economic, and social development to make important decisions. As the person in charge of the state's first-level soft-science research organization, Hu has his own ideas on the further development of soft science.

He said that soft-science research is decision research. There has been greater development in the soft sciences in recent years, which is an important mark of the acceleration of democratization in decisionmaking and progress in scientification. It indicates that the political, economic, cultural, and scientific levels of our country have developed to a new height and that the society is being transformed to a modernized one. The reason for the rise of soft-science study and the acquisition of some important results is the existence of a relatively democratic political environment after the 3d Plenum of the 11th CPC Central Committee, which was favorable to freedom of thought and speech. After the implementation of the reform and the opening-up policy, there emerged many new problems in our country, and we need to have a group of people able to resist political interference and think and study these problems independently to advise leaders in their decisionmaking. Furthermore, the rise of modern scientific methodologies such as the "three theories" (information theory, control theory, and systems theory) and the "three new theories" (dissipating structure theory, synergy theory, and mutation theory) and the appearance of advanced methods of calculation, measuring, and testing have created conditions for the growth of soft science, which provides the possibility of having the decisionmaking work built on the basis of a precise and correct scientific theory.



Yet, for the further development of soft-science research to be democratic and scientific in policy-making, Hu thinks that there must be breakthroughs in some aspects and some obstacles need to be cleared out.

First is concept change. Owing to the influence of the paternal control of the small-scale patriarchal production system for several thousand years in the past, a few people, relying on their power, position, personal experience, ability, and intelligence, made decisions on policies, which were taken for granted. Added to the influence of "leftism" for a long period of time, it became even worse, so that policy-making depended mainly on power; whoever had the greatest power, it seemed, represented the greatest truth. The "party committee responsibility system" often turns out to be that whatever the secretary says counts. Thus, "what I say goes" flourishes. The will-only theory and overcentralized power spoiled the democratization and scientification of decisionmaking. Up to now, this kind of influence has not been rooted out. Some who are in charge of certain departments accept with pleasure research reports which appeal to their liking; otherwise, they turn a deaf ear.

The development of soft science requires an environment with a high level of political democracy and academic freedom. These are the external conditions for the development of soft science. Democratic and scientific policy-making is an important realization of a high level of the democracy of the socialism in our country. Where there is political democracy, there will be collective wisdom and freedom of speech; where there is academic freedom, there will be independent thinking and creativity. The people are the masters of our country and it is only natural that they should enjoy all of their democratic rights. At present, we should first carry out the rights endowed by the Constitution and let the masses freely express their opinions within the limits allowed by the law, and political affairs should also be allowed to be discussed. To ensure academic freedom, we must carry out the double hundred principle. In academic problems, leaders should not interfere with administrative measures. Academic problems can be solved neither with votes nor with the establishment of an organization. They can only be solved through discussion; the most important thing is to protect the minority and protect those who hold opposite opinions.

Mentioning policy-making systems and legislation, Hu thinks that we still lack a complete set of democratic and scientific procedures and systems in policy-making. In policy, power and responsibility should be divided, and the operating mechanism, supervision, and the feedback systems in its implementation should also be clearly defined. Systems and legislation are important contents of political system reform. The core is to use a complete procedure and system to help enrich, restrain, and supervise the policy-makers at different levels and to acquire possible democratic and scientific policy to avoid serious mistakes.

He said that another contingent is needed in the development of soft science. Those who do soft-science study need to know both natural science and social science, and the requisites are high. But at present, there is no university cultivating this kind of talent and it definitely does not fit the developing

circumstances. In addition, soft-science study also requires some necessary things, such as information data and sources. Some departments and authorities, for the narrow interest of the department or district, seal off materials or even provide false data. These managerial problems should be solved as soon as possible.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### CAS STRESSES PRACTICAL APPLICATIONS

OW252143 Beijing XINHUA Domestic Service in Chinese 0215 GMT 21 Jan 87

[By reporters Wu Ming, Meng Xiangjie]

[Excerpts] Beijing, 21 Jan (XINHUA)--The China Academy of Sciences [CAS] is undergoing a "fission." Many of its research institutes have set up technological or production establishments, and more and more scientific and technical personnel have left the "cold bench" to develop technology or put scientific and technological innovations into wide use. A new situation of "Coordinated operation of services" has emerged.

According to statistics, the CAS has set up some 80 technical companies of all types, with more than 1,000 scientific and technical personnel with high- and middle-ranking technical titles engaged in technology development and the technology business.

The CAS, which has a staff of 80,000, is China's center for research in natural sciences. For many years, the research institute stayed outside the economic system. Although it turned out a great many research achievements over the years, these research achievements were locked in the safe and more and more of them became "waste products." The traditional mode of research and values resulted in the situation of "laying stress on basic research and neglecting application" and "setting great store by results but taking development lightly," thus cutting off the intermediate link of transferring results to the production sector.

People figuratively describe the changes in the CAS in this way: "On the outside it is still an egg, but qualitative change has already taken place inside." At the research institutes, the values of research personnel changed first. Besides research papers and samples, they also regard their contributions to society as a criterion for judging their achievements. They have extended their sight to research projects needed by society. At the same time, the internal structure of the research institutes also underwent some changes and a new contingent of people specializing in putting research achievements into wide use and developing technology have come into being.

The CAS of today has opened its door wide and oriented its work to the needs of society and the world. It maintains its strong points in advanced research but also pay attention to the social benefits and economic benefits of its achievements.

## NATIONAL DEVELOPMENTS

### CAS COOPERATION WITH HARBIN ENTERPRISES REPORTED

Tianjin JISHU SHICHANG BAO in Chinese 29 Jul 86 p 1

[Text] To utilize fully the S&T potential at the Chinese Academy of Sciences [CAS] and improve cooperation between S&T research units and the enterprises, the Harbin municipal economic committee recently arranged to let the directors of more than 30 enterprises come to Beijing to discuss cooperation items with CAS research units. All of the items are new results from the institutes of CAS, with higher standards and greater applicability. Within a few days, through serious discussion, 12 items of cooperation development have been signed, which lays the foundation for full-scale cooperation.

The negotiation of the cooperation has been smooth and the development fast. These are the following characteristics:

First is the emphasis of leaders and full preparation. At the end of March, comrades in the National Economic Commission's S&T Bureau and the CAS energy commission in Harbin conveyed the intention of CAS and the universities to establish close cooperation with the enterprises. In mid-May, Lieutenant Governor Hong Qipeng [3163 0120 7720] arrived in Beijing, visited the National Economic Commission and CAS, and expressed his intention to cooperate with CAS as a way of emphasizing a parallel tie of Harbin municipality with 100 other cities, which acquired great support from the National Commission. Hong was warmly received by CAS. At the same time, the director of the Harbin economic committee went to the 9 institutes in Beijing and collected 130 S&T results and distributed them to the enterprises in Harbin to let them choose the appropriate items for cooperation. Thus, it changed the practice in the past when cooperation was decided simply by the administrative authorities, and started with concrete items with which it is easy to gain results.

Furthermore, cooperation has not been limited to large and medium-size enterprises, and the small enterprises, collective enterprises, and rural enterprises all joined this activity enthusiastically. It is more favorable to the utilization of the advanced-technology and S&T results of CAS to transform them to productivity to serve national economic construction. For example, Harbin's Acheng Heijiacang plant made an agreement with CAS's microbiology institute on the technology transfer of utilizing the peels of Heijiacang fruits.

The third is that both sides draw on the strengths of each, offset the weaknesses of the other, and develop together. The new wide-band governor DC servo motor is an item of cooperation between the state-owned Binjiang electrical plant and the CAS electrical engineering institute, which is a precision servo element. It can replace the direct transmission between gears in position and speed systems, which provides precision for the system. This kind of motor is small in size, light in weight, and tight in structure and the magnetic parts are made of neodymium and iron alloy. This material can be used for new type motors to improve performance and quality and create conditions for its export.

Harbin also raised 15 difficult technology questions and will go to CAS institutes and universities in Shanghai, Nanjing, Hefei, and Wuhan to negotiate to expand the scope of cooperation.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### PROMOTING EXCHANGE OF TALENTED PERSONNEL DISCUSSED

Tianjin JISHU SHICHANG BAO in Chinese 12 Aug 86 p 1

[Text] Tianjin's talented-personnel exchange service center pointed to the need of society to unfold the exchange service to meet the needs of economic, S&T, and educational system reform. In the past 2 years, they insisted on the organized and guided talent exchange service which resulted in the rational mobility of nearly 1,500 professional technological personnel, and made it possible for talent to develop, and created obvious results and interest for the society.

Based on the change in the industrial structure, they enthusiastically adjusted the talented for the newly established and expanding units to ensure the smooth accomplishment of key items. For example, newly established or expanding units in Tianjin such as the Second Gas Plant, the Automobile Industry Company, the United Radio Company, etc. needed talented people urgently, and they took the initiative to contact these units and recommended the specialists needed. Many professional technological personnel were transferred, gave full play to their capabilities, and distinguished themselves. After Wang Shifa [3769 0013 4099] was recommended by the center, and transferred to the Tianjin International Store, he put forward a complete set of regulations to strengthen the management and made contributions to improve the store to meet the requirements of opening up to the outside to be a modern enterprise.

To meet the demand to change for the better, they took the initiative to transfer talented people to the units which needed talented people urgently or wanted to improve or develop new products. Tianjin's refrigerator plant with only 200 staff members and workers wanted to improve their sales and did not spare 25,000 RMB to buy a house as the condition to introduce an engineer from a research institute in Tianjin. Nevertheless, there arose difficulties in the process, the center came out to help, and the problem was properly solved. After the transfer, this engineer solved some key technological problems in the development of new products.

They also adopted some special measures for suburban, county, and state farms around Tianjin where knowledge and talented people are urgently needed. Anyone who wants to be transferred to work in suburban, county, or state farms will be, in principle, supported and helped. Some personnel from

collective units were granted exceptions to be transferred as state cadres. Some professional technical personnel whose transfers were approved by brother provinces or municipalities but were not qualified to be transferred to the cities were arranged to be sent to the suburban, county, or state farms to work. Zhou Peiyun [0719 0012 0061], a cadre in the municipal gas company and a graduate from the Tianjin Finance and Economics College and with the help of the center, was transferred to his hometown in Jinghai County and was assessed as a model teacher in the municipal party. With the assistance of the center, the Tianjin municipal farm bureau has introduced more than 40 technical personnel with more than college education and most of them have become backbones in their businesses. Twenty of them have taken on the post of leaders at different levels.

To meet the demand of the opening up to the outside, the Tianjin municipal talent exchange center enthusiastically recommended talented people to the joint-venture enterprises and enterprises introducing foreign technology. Examples include their introducing French-speaking, decoration design, and administrative personnel for the Sino-French grape wine plant, and transferring urgently needed managerial personnel for the Crystal Hotel, a joint venture of China and the United States.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### SITUATION OF BEIJING'S S&T PERSONNEL ANALYZED

Beijing BEIJING KEJI BAO in Chinese 8 Aug 86 p 1

[Commentary by Cui Zihang [1508 1311 5887], assistant researcher, Center of Economic Information, Ministry of Machine Building: "Situation of Beijing's S&T Personnel Analyzed"]

[Text] To give full play to the superiority of the capital in human resources depends on policy and the formulation of a correct policy, which first needs an analysis of the current situation of human resources.

Current S&T personnel in the capital can be divided into three levels. The first level is made up of college graduates under the age of 40. In this group some just graduated and some entered college or graduate study through self-study. Now, at this level, for many, what they think about is not doing a good job, but further study to pursue graduate study or study abroad; many do not keep their minds on their work and most of their time is not used to perfect their work but to study foreign languages or brush up on fundamentals. This is related to our current policy. Don't overemphasize degrees. The current policy affects not only graduates but also students in school. College graduates do not pay attention to their graduate projects but crave graduate study. This situation, if not guided properly by our policy, will become more serious.

S&T personnel aged 40-50 belong to another level. These people hope to have results and improve their lives, housing, wages, and also positions but mainly want to work and emphasize working conditions. So, to attract these people, there must be projects for them to do, and their living conditions must be improved appropriately. Still there are complicated problems, such as the site of work, the schooling of their children, etc. We should let these people shoulder the heavy load, otherwise it will be a great waste of human resources.

S&T personnel aged 50-60 belong to the third level. They have abundant experience and a considerable number have retreated gradually from their administrative posts. They urgently need to work and execute their influence. In general, they are not busy in their household work and their children have grown up so they have more time. Therefore, they have better conditions for work. We can invite them to be advisers to a project, that is, advisers on a special topic, to join periodically the work in some projects without the formalities.



## NATIONAL DEVELOPMENTS

### S&T PERSONNEL URGED TO GO WHERE NEEDED

Beijing GUANGMING RIBAO in Chinese 14 Aug 86 p 1

[Article by reporter Miao Jiasheng [5379 1367 3932] and correspondent Fan Guilan [5400 2710 5695]: "CAS Urges S&T Personnel To Go to Units in Need"]

[Text] "It is just like marrying a daughter" to be transferred out of the Metals Research Institute of the Chinese Academy of Sciences [CAS] where in the "parent's home" everything is "prepared." These are the words from the bottom of the heart of an S&T person who was transferred out of the CAS Metals Research Institute. This institute has taken a series of measures to promote the reasonable circulation of personnel and the initiative for creative mobility for accumulated S&T personnel to move to the units in urgent need. From 1980 to the month of June of this year, 226 people have been transferred out of this institute. It not only has opened up new areas for the able ones but has also made the S&T personnel structure in the institute more reasonable.

There are a large number of talented people in that institute. In the past, owing to the closed personnel management system, the intellectual structure of the S&T personnel was not reasonable, and among the high-, middle-, and low-rank personnel, there appeared a situation of "too small at the ends and too small in the middle," and for a great number of middle-rank S&T personnel, there was no scope for their abilities. In the reform of the S&T system, this institute started to open channels to transfer people out and encouraged accumulated personnel to send to the units in need. The leader of that institute regarded the four modernizations as very important and tried honestly to create conditions for transferring people out. They insist on the principle that the people transferred out must be able people and that the institute is responsible to the state, to the people transferred, and to the units receiving them. They would rather keep the personnel of lower quality to themselves and digest them than send them out to add to the burden of other units. Whenever any other unit came to recruit S&T personnel, the personnel department of the institute would publish the notice and anyone who met the requirements would be able to apply. They also adopted a three-sided method based on the recruiting unit, the applicant, and the personnel department having a discussion together to make all satisfied.

For the transferred S&T personnel, the institute still cares about their work and lives and does its best to help them satisfy reasonable demands. For this some measures are taken: 1) To keep contact with the transferred in their administrative work and regard them as guest researchers, some can still keep their positions as members of the academic commission of the institute as consultants, and some cooperate with the institute doing some S&T research or teaching graduates. For those asking for S&T help, they will try to help. 2) Giving priority to the assessment of the professional position promotion of the transferred, according to the same standard. Thirty of the transferred applied for a promotion to an advanced position and the assessment commission of the institute examined all and approved 18 of them and they will be promoted to advanced positions by their employers. 3) After arriving at the new unit, if there is no housing available in the new unit, their housing application in the old unit is still effective.

For several years, more than 200 S&T personnel have been transferred out of the Metals Research Institute and all of them can give better play to their knowledge and skills; many are put in important positions to be leaders or promoted to higher positions.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### BONUS MAKES NEW TECHNICAL WORKER HIGHEST PAID PLANT EMPLOYEE

Beijing GUANGMING RIBAO in Chinese 30 Nov 86 p 1

[Report by Lu Liang [4151 5328], Ye Hui [0673 6540], and Huang Dongyuan [7806 0392 0337]: "Scientists and Technicians Afforded Courteous Reception at the Hangzhou Universal-Joint Plant"]

[Text] College student Zhou Jianqun [0719 1696 5028], 22 years old, and who has been at the plant for only a year, with a 203 yuan bonus to his monthly salary, has become the highest paid person at the Hangzhou Universal Joint Plant No 2 metalworking shop.

"Scientists and technicians have brought wealth to this factory, so they should be afforded a just compensation." The other day, as we were gathering material at this factory, farmer entrepreneur and plant director Lu Guanqiu [7627 0385 3808] said this to us, "The town and township enterprises will not only bring wealth to farmers, but we should also allow the scientists and technicians who work in town and township enterprises to create the conditions for that wealth to also be enriched!"

In recent years, Lu Guanqiu has attracted the worthy and employed the talented by this means, through which they have gained 28 college students and 4 engineers and assistant engineers. These scientists and technicians have been warmly received at this town-run enterprise: they have been presented with bicycles, wages have been moved up a rank, 32 units of dormitories have finished construction, and the scientists and technicians may move into their new quarters within the year. Bonuses are generous, and as soon as they have proved themselves, they are praised and rewarded. Last year, assistant engineer Qi Weidong [2058 5898 2639] came up with an innovation that allowed a reduction in cost for each set of universal joints of 0.66 yuan, over last year and this year saving 160,000 yuan in costs. He was therefore awarded a large bonus by the plant director.

Universal joint staff members who had taken off farm clothes not that long ago to put on worker's uniforms, and were still holding half a hoe handle in their hands did not understand at first the various kinds of preferential treatment being given the scientists and technicians by Lu Guanqiu, and in fact were prejudiced against intellectuals. Zhou Jianqun, an electromechanics major in the automation control department of the Nanjing Aviation Academy who

graduated in 1985, took the initiative in abandoning work in a big city and volunteered to come to this town-run enterprise. As he came to the No 2 workshop, he was met with untrusting stares. After a month, people began to look at him with new respect. There were many advanced pieces of equipment in the No 2 workshop, but because workers were not familiar with the features of the machinery, the advanced machinery could never be used to its full effect. One day in September of last year, the automatic switches on three of the automatic grinders in the shop failed, and Zhou Jianqun volunteered for the difficult task of repairing them. He had worked for just a little while before the machines were running normally again. These workers gasped in admiration, "So after all, it really is useful to drink up a lot of ink like these college students!" Zhou then became an indispensable person in the workshop.

In actual work, these practical-minded workers understand the importance of knowledge, and they have gotten rid of that farmer notion that scorns knowledge, and now respect the fact that knowing has become an activity of self-awareness. In the monthly evaluations for bonuses, the workers all evaluated Zhou Jianqun in the highest rank. "Zhou has taken the highest, we are convinced." In July of this year, the workers also wrote a report to the plant director requesting a healthy bonus for Zhou, and Lu Guanqiu approved 300 yuan for Zhou.

12586

CSO: 4008/2040

## NATIONAL DEVELOPMENTS

### COMPENSATED ASSIGNMENT SYSTEM FOR GRADUATES DISCUSSED

Beijing GUANGMING RIBAO in Chinese 2 Dec 86 p 2

[Report by Gu Yonggao [7357 3057 7559]: "Beijing Computing Academy Tries Out a Graduating Students Compensated Assignment System"]

[Text] The Beijing Computing Academy has been trying a compensated assignment system for graduating students for 2 years, the results of which have shown that the employing units, the students, and the school are all satisfied.

The Beijing Computing Academy began last year to try out a system of compensated assignment of graduating students, which was approved by the Beijing Municipal People's Government. Their principle for assignment is "people make the most of their talents, they study to be employed, there is overall consideration, and proportions are reasonable"; the method used is "public announcements of plans, supply and demand is taken into consideration, submit forms stating your aspirations, and the best will be assigned." First of all, the school and the employing unit sign contracts on the basis of linking supply with demand, after which the plans are announced to the graduating students. On the basis of events convened to allow the employing units to meet the students, there is a mutual sharing of intentions, an understanding of conditions, after which the students report their desires in accordance with the standards of the employing units and with his or her own conditions. Then, the lists of names are published by the school on the basis of the wishes of the graduating students and on a comprehensive arrangement of their scholastic record over 4 years, their political manifestations, and their physical condition. These are recommended to the employing units, and they discuss the names submitted as an object of recruiting in accordance with choosing the best. With the agreement of the employing units and the graduating students, they sign on with the assigned unit. Because the compensated assignments are a combination of the "three methods," this reduces intermediate links, and students this year were sent off in only 3 days.

The Beijing Computing Academy feels that trial implementation of the compensated assignments for graduating students has had the following good points:

1. It has helped in overcoming the phenomena of mismatched specialties and wasted talent, and has allowed the employing units to better value talent. In the past, assignment programs were planned on orders from the municipal personnel office, and it invariably happened that units with computer

equipment could not get the graduating students they needed, while units that lacked equipment were given personnel who had studied computing, which resulted in a waste of talent. After implementation of compensated assignments, because the employing unit has spent the money, they pay close attention to training and using these college graduates reasonably, and also strive to provide the conditions for them to make the most of their specialized abilities.

2. It has been beneficial to arousing the enthusiasm of students in fully developing their virtues. Upon their compensated assignment, graduating students receive choices in two areas: 1) freedom of recruitment by employing units in accordance with needs and standards; 2) priority assignments by the school. These two choices put a certain pressure on students, and it is easy to instill a competitive attitude. When you add the fact that all behavior and every test score is closely related to the assignment after graduation, this prompts them to exert themselves when in school, to have results from their studies, and in their positions after assignment to do their jobs and exercise their responsibilities to the utmost, and to work hard.

3. It has strengthened relations between the school and society and has promoted educational reforms at the school. The compensated assignments of graduating students allows schools to obtain feedback information from the employing units, and to adjust specialties and curricula facilities to reflect the needs of society. At the same time, it has also aided teachers in renewing their specialist knowledge and the subject matter of their teaching materials to meet the demands of training goals. In accordance with social needs, this academy established a microcomputer major in its technology department, and the computer science department has increased its software curriculum and the time for students to be on-line with computers, which will change the knowledge structures of students and enhance their ability to get right to work.

4. It has allowed the movement of talent to be more reasonable, and to make better use of the strong points of a specialty. In the past, some units in remote locations and under hardship conditions had a hard time filling assignment quotas. With the compensated assignments, the supply and demand meetings have allowed graduating students to understand the current situations and prospects for development of these units, after which many have desired to submit their names for selection. The Yanshan Petrochemical Corporation selected 3 people from among more than 20 last year, and the Logging Company of the Ministry of Petroleum Industries employed 6 people this year.

5. It has benefited socially subsidized education, supplementing the inadequacies of funds for running the school. In its trial of the compensated assignments, this academy has taken in more than 1.4 million yuan over 2 years. Of that, 700,000 yuan was used to buy a modern computer from abroad, which resolved an urgent need in teaching and research, and the remaining funds were also used to purchase teaching equipment and to improve the conditions for running the school.

12586

CSO: 4008/2040

## NATIONAL DEVELOPMENTS

### WUYI UNIVERSITY FOSTERS RANGE OF TALENT

Beijing CHINA DAILY (SUPPLEMENT) in English 27 Dec 86 p 6

[Text]

Preparations for the establishment of Wuyi University in Jiangmen started in 1983 when participants of the first conference of returned overseas Chinese and their relatives put forward the suggestion that an institute of higher learning be set up for the city's more than 2 million overseas natives. The suggestion was applauded and the name of the school was announced at the second conference. The university was founded to revitalize the local economy and train specialized workers to bring about a more prosperous home for those who have returned from abroad.

The corner-stone was laid on March 6, 1984. In the following year, the State Education Commission and the State Planning Commission formally approved the establishment.

The campus, which is still under construction, is planned to cover about 164 acres with a total recruitment of 4,000 students, mostly from nearby areas. Courses for bachelor's degree students are set for four years, and two to three years for specialized majors. Favourable treatment will be given to overseas Chinese and their relatives. At present there are about 600 students at the university.

The people's government of Guangdong Province designated Ye Jiakang, former assistant professor of the Beijing Aviation College, as the president of the new university.

Some of Wuyi University's courses are under way. Eventually, electronic engineering, construction, management, engineering, applied computer studies, foreign trade, Chinese literature, and foreign languages will be offered, as well as specialized courses in design and manufacture of electronic engineering, chemical and light industry and food industry.

After two years of construction, the school already has a library, exercise grounds, canteen, dormitories, hostels and other study and living facilities. A main building, covering 38,000 square metres, and Heshanlou (Building on Crane Mountain) hotel, financed by local villagers, will be put into operation in the near future. By the end of this year, the entire university will boast classrooms and dormitories covering 70,000 square metres, about one-fourth of the total construction area.

The school attaches great importance to the construction of

laboratories and libraries. To date, it has already put to use several laboratories for computers, electronics, general physics and linguistics. Equipped with advanced instruments and apparatus, the laboratories give students a good opportunity for strict training and in practical work.

A high-quality teaching staff is the key link to running a high-quality university, so the school has recruited a large number of experienced professors, lecturers and engineers who are skilled in teaching and scientific and academic research. They come from Qinghua University in Beijing, Beijing Aviation College, Shanghai Communications University, Wuhan University and other famed institutes. So far, the university has more than 200 teachers, among whom there are 21 professors, 89 lecturers and three foreign experts.

Jiangmen's overseas natives have shown great support for the school in their home town and have set up a commission for the preparation of the founding of the school.

The commission is responsible for fund-raising, publicity and recommending of overseas scholars to give lectures at the university.

/9317

CSO: 4010/1015

## NATIONAL DEVELOPMENTS

### JIANGMEN BIOTECH BASE MAKES HEADWAY

Beijing CHINA DAILY (SUPPLEMENT) in English 27 Dec 86 p 6

[Text]

The unicellular protein experimental centre in Jiangmen City, internationally known as the Jiangmen Biotech Base, is a branch of the China Biotechnological Exploration Centre and is the first industrial biotech centre in the country. Established with the approval of the State Planning Commission in 1984, the project is listed as one of the country's priority industrial experimental schemes.

With Jiangmen's downtown area on the right, the Pearl River on the left and Zhuhai to the north, the centre is blessed with convenient transport. The Pearl River is wide and deep and Jiangmen has a specialized harbour. Covering more than 200,000 square metres, the centre is to be completed by the end of next year, forming a comprehensive system combining scientific research and production with office buildings — a 10-thousand-ton unicellular protein factory, a laboratory building, workshops,

water supply and sewage system, storage, repair workshops and living quarters. Construction has been accelerated by advanced technology imported from West Germany and Switzerland. In addition to production of unicellular protein, this advanced technology will also create the potential for future explorations.

Bioengineering is a means of linking biotechnology and engineering with production, focusing on processing of biological materials, manufacturing biological substances and then utilizing its functions for other production. The centre makes unicellular protein products via fermentation of honey and yams or other raw materials that contain sugar and starch. Further processing results in all kinds of protein products, applicable to the country's food industry, fodder industry and animal husbandry. A strong staff has taken shape, with

a number of highly skilled foreign experts to provide consultancy services.

Although the centre is only partly completed, work has already begun. The staff has produced several new kinds of fodders and other products that are being sold as far away as western Europe.

They have also helped local township enterprises to build fodder factories, food processing plants and snake venom services. The unicellular protein factory subordinate to the centre is now capable of producing more than 30 varieties of fodder for chickens, ducks, pigs and prawns, greatly promoting local breeding industry.

In the past several months, they have successfully developed a series of shrimp foods, which are already bringing economic benefits to a local shrimp growers working on thousands of hectares of ponds.

Fomentation additives produced by the Shenghua factory belonging to the centre are being used now by the Qingdao Brewery. The centre's success is attracting visitors from around China and abroad, who inevitably praise the centre. The chief of the centre told reporters that it welcomes cooperation with experts, industrialists and other organizations connected with domestic and foreign firms.

/9317

CSO: 4010/1015



## NATIONAL DEVELOPMENTS

### NEW PASSENGER PLANE PRODUCTION PLANS DETAILED

OW121922 Beijing XINHUA in English 1526 GMT 12 Jan 87

[Text] Beijing, 12 Jan (XINHUA)--China is seeking foreign cooperation in the production of large passenger planes for major air routes to meet the demand of the 1990s.

Li Anping, deputy director of the civil aircraft department of the Ministry of Aviation Industry, said today that the message has been conveyed to Boeing and McDonnell-Douglas of the United States and the Federal German MBB Company and received strong responses.

He said that China prepared to produce a 150-seat passenger plane during the 1990s and hoped the three foreign air companies to submit their proposals in March so that China will decide on the cooperation partner.

Such a plane has a large potential market, Li said. At least over 100 such planes have to be produced to meet the export needs and the needs of rapidly developing domestic civil aviation.

Li said that China will no longer import aircraft for use in agriculture and forestry, adding that China will modify the domestically-made Yun-5 aircraft for domestic airlines and other clients.

The Beijing Institute of Aviation Engineering and the design institutes in Chijiazhuang and Hubei Province have begun to develop a new generation of aircraft for use in agriculture and forestry and the domestic demand for such aircraft could come to one thousand instead of a few hundred.

In addition, Li said, China will develop and modify other types of small passenger planes.

/6662

CSO: 4010/2007

## NATIONAL DEVELOPMENTS

### LAW ON TECHNICAL CONTRACTS TO BE ISSUED

OW121952 Beijing XINHUA in English 0821 GMT 12 Jan 87

[Text] Beijing, 12 Jan (XINHUA)--China's key science and technology projects will gradually be put up for public bidding in the coming four years and risk investment be also made in developing new technology.

Advanced technology will be developed, applied and spread by means of technical contracts, a senior official told Chinese legislators today.

"This is the strategy of China's science and technology development for the future," said Wu Mingyu, vice-minister of the State Science and Technology Commission, in his report to the 19th meeting of the Standing Committee of the Sixth National People's Congress (NPC) on the draft law on technical contracts.

Wu said that a great amount of technology appropriate for medium-sized and small enterprises, rural enterprises and rural development would also be transplanted into the framework of the rural economic development through technical contracts.

China began to introduce technical contracts nationwide from 1983. Technical markets were also opened in 1984. In recent years, many forms of contracts for technical development, technology transfer and technical services have emerged in practice. A coordinating body under the State Council was also founded in April 1985 to better "open, enliven, support and guide" technical markets.

Technical contracts were introduced for technological development, technology transfer and technical services between scientific research bodies, institutions of high learning, social bodies and factories. Many state projects also found their way into the technical markets. Some imported items were developed by domestic agencies through technical contracts.

He held that technical contract has become a basic form of organizing scientific research, technical development and managing scientific work both now and in the coming years. So the enhancement of overall management of technical markets has become a matter of urgency.

Wu Mingyu said that the law on technical contracts (draft) had provided explicit terms for legal forms employed by litigants involved in technical contracts. The draft also contains provisions governing technical development, technology transfer and technical services, the protection of property rights, confidentiality of technical information, sharing of scientific research findings, commitment of investment risk and violation of rights.

/6662

CSO: 4010/2007

NATIONAL DEVELOPMENTS

LI GUIXIAN CALLS ON S&T TO BENEFIT ANHUI ECONOMY

OW260529 Hefei ANHUI RIBAO in Chinese 7 Dec 86 p 1

[Excerpts] On the morning of 5 December, Li Guixian, secretary of the provincial party committee, and Deputy Secretary Lu Rongjing had a cordial conversation with some of the experts and science and technology workers attending the "Fourth Congress" of the Provincial Scientific and Technological Association. Their conversation focused on the question of how to invigorate Anhui's economy.

At the beginning of the forum, Li Guixian told the participants: I am very concerned about the questions of how to rapidly turn science and technology into production force, and how to develop Anhui's commodity economy as soon as possible.

Lastly, Li Guixian said: Anhui's economy cannot be considered developed compared with other provinces in China. Therefore, it particularly needs science and technology. This is the key to invigorating the economy. Quite a number of countries have prospered, depending on wisdom, knowledge, and technology, not on natural resources. If we truly apply science to production, a very simple technology will yield very great economic results. Speaking of lateral cooperation between science-technology and production, he hoped that the scientific and technological associations, societies and experts at all levels would give full scope to their own strong points in promoting cooperation. He said: Lateral cooperation is not necessarily limited to one province or one locality. It can be extended to all China and the world as well.

/8309

CSO: 4008/2050

## NATIONAL DEVELOPMENTS

### BEIJING TO FOCUS ON AUTOMATION TECHNOLOGY

Beijing BEIJING KEJI BAO in Chinese 1 Sep 86 p 1

[Article by Yan Xiaojun [0917 4607 6874], director of the Beijing Automation Association: "Beijing To Focus on Automated S&T Development in Seventh 5-Year Plan"]

[Text] Automation technology is an important pillar in the world's new technological revolution and as the material basis of automation technology, it is automating industry. Owing to the fact that automated industry belongs to the category of technology-intensive, low energy consuming, and non-polluting industries, it fits the features of our nation's capital perfectly. For this reason, I suggest using the development strategy of automated industry in Beijing as an important part of the strategy of S&T development and economic development in Beijing.

Here I want to give my suggestions about the strategy of developing automated industry in Beijing:

1. Technology innovation first. We should select in Beijing several "hot selling" products and backbone enterprises, leading organizations, key research institutes, laboratories, key stores and warehouses, important high-rise apartment buildings, and transportation, water conservation, energy resources, and agriculture to proceed with automated technology innovation, in order to promote automated technology innovation in every profession and the development of automated industry in Beijing.
2. Promote automated industry in Beijing. Pay great attention to the production bases of automated components and complete sets and the design units of automation system engineering. On the basis of introduction of advanced technology from foreign countries, we should enable the automation industry gradually to become locally manufactured.
3. Integrate mechanical engineering, electronics, and instruments into one technology to promote integrated products and create new traditional products in Beijing to realize step by step the intellectualization of automated industry.

4. Promote the application of automated management systems in the enterprises and study step by step the application of "expert systems" and "artificial intelligence" in the management of enterprises in Beijing.
5. Promote computer-aided design and manufacture in some professions.
6. Develop new automated systems and their application in enterprises in Beijing.
7. Reform the systems to free them from conventions to meet the requirements of the new technological revolution.
8. Formulate correct policies and strengthen the legal system; things that can be manufactured locally shall not be allowed to be imported to protect national industry.
9. Select key points to test several new automated systems such as flexible production systems and computer-integrated production systems.
10. Formulate automated-technology economic policies at different levels and different professions in Beijing, and give priority to promoting automated items with greater economic results such as raising production, improving quality, saving energy and materials, lower costs, and raising efficiency. Automated technology which can bring obvious economic results should be decisively adopted.
11. The abnormal situation of "larger center and smaller ends" existed in automation work in the past; promote input and output interfaces, sensors, probe and transfer mechanisms, and executing mechanisms.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### TECHNOLOGY DEVELOPMENT GROUPS ARISE IN BEIJING

OW251204 Beijing XINHUA in English 0812 GMT 25 Jan 87

[Text] Beijing, 25 Jan (XINHUA)--As China's reform in the field of science and technology is continuing, a growing number of nongovernmental technological development organizations has emerged in the Chinese capital of Beijing.

According to a forum of nongovernmental technological development organizers and inventors held yesterday, the number of such organizations has come to more than 700.

Compared with the government funded research and development organizations, they are more flexible in operations and management and more directly serve the market and end users. With sole responsibility for profits and losses, they offer a complete range of services, including research and development, production, sales and maintenance, mostly of high and new technology.

Such organizations were formed by individual technicians and scientists or by collective units on a voluntary basis. Most of them are making profits.

A recent survey showed that the 141 such institutions in the Haidian District in the northwestern part of Beijing, in which most of the universities and colleges are situated, undertook 3,000 development projects from January 1984 to March 1986 and 200 of them were new in China. These projects yielded a combined value of 170 million yuan (about US\$45.9 million). They also delivered to the state 58 million yuan in tax and donated 500,000 yuan to public projects.

"The emergence of nongovernmental technological development organizations is the product of the current reform of science and technological work in the country," said Lu Yucheng, director of the Municipal Science and Technology Committee, adding that in the new year more researchers and technicians are encouraged to leave state research institutions to contract for development projects in the countryside or to run small enterprises and engage in technological development projects.

/8309

CSO: 4010/2006

## NATIONAL DEVELOPMENTS

### BEIJING EDUCATION, RESEARCH COOPERATION GROUP FORMED

Beijing GUANGMING RIBAO in Chinese 7 Dec 86 p 1

[Report by Gu Yonggao [7357 3057 7559]: "Eight Institutes Join in Beijing to Establish an Education-Research Cooperation Group"]

[Text] On 6 December, institute directors from eight higher institutions in Beijing Prefecture gathered at the Beijing Aviation Academy, where they discussed and passed "Rules for the Education-Research Cooperation Group of eight Institutions in the Capital."

These eight institutions are the Beijing Aviation Academy, Beijing Shifan University, the Chinese People's College, the Beijing Steel Academy, the Beijing Academy of Medical Sciences, the Academy of Northern Transportation, the Beijing Academy of Posts and Telecommunications, and the Beijing Industrial Academy.

On the principles of being voluntary, equal, mutually beneficial, and consulting, between each cooperating institution there will be planned, reciprocal permission for graduate students to attend each other's classes, and training with dual advisors; it will be permitted that some students of a particular major can attend classes interchangeably, that tests and grades will be mutually accepted, and that there will be training of students in new overlapping disciplines; it establishes school-level cooperative research structures that transcend disciplines; there is a mutual opening up of major laboratories and a supplementation of material deficiencies; certain high quality teaching materials, specialty writings, and serial teaching reference books can be jointly written, co-authored, and jointly published; teachers from other schools can be hired to teach classes that a particular school lacks; scholars, teachers getting advanced training, and post-doctorates can be exchanged; academic conferences can be jointly organized on a school basis, within the country, or internationally; there can be joint holding of theatrical festivals, athletic competitions, and lectures in various disciplines, which will enrich the cultural lives of teachers, students, and personnel.

12586

CSO: 4008/2040



## NATIONAL DEVELOPMENTS

### GUANGDONG AWARDS SCIENTIFIC ACHIEVEMENTS

OW231758 Beijing XINHUA in English 1436 GMT 23 Dec 86

[Text] Guangzhou, 23 Dec (XINHUA)--Guangdong Province awarded here today some scientists who have made outstanding achievements in promoting science advances.

The science advances achieved in the past three years by research groups and individuals have been involved in 216 projects, according to an official from the provincial science and technology commission.

Initial statistics show that 154 of them which were put into production a year ago have generated 1,247,900,000 yuan (US\$337 million) in output value.

A research item which won first-class prize today has helped raise freshwater fish output.

Last year, 11,600 hectares of water ponds were tried with the new breeding technique and 8,706 tons more fish were caught, adding 17.41 million yuan.

This new breeding technique has been introduced to many parts of Guangdong Province.

In 1984, the Chinese Government issued award regulations to encourage scientists to promote scientific and technological advances.

According to the "Regulations on Awards for Promotion of Scientific and Technological Advances," those groups and individuals who make major contributions to scientific and technological progress will be awarded.

/8309

CSO: 4010/2006

## NATIONAL DEVELOPMENTS

### HAIDIAN'S 'ELECTRONICS STREET' HOME OF S&T VENTURES

Beijing GUANGMING RIBAO in Chinese 30 Nov 86 pp 1,3

[Article by Xu Jiuwu [1776 0046 2976]: "A Fresh Flower Bursts Open in the Integration of Science Research with Production"]

[Text] The Haidian district situated in the western outskirts of the capital has a concentration of more than 80 institutes and more than 30 higher institutions, at which there are 180,000 scientists and technicians (including graduate students and undergraduates), so that it may truly be described as having talent in great numbers and a concentration of knowledge! In recent years, this area of "hidden dragons and sleeping tigers" has undergone unprecedented changes, and in the tide of economic and science and technology reforms a group of scientists and technicians have thrown away the "iron rice bowl," have left the high-rises and large institutions, and have absorbed some of the idle personnel in society and youth looking for work to run more than 300 science and technology centers and companies. They have all sorts of organizational forms: they have collectives, public-type, those run by two firms, and those run by many, among which there are more public science and technology organizations collectively operated, some 70 percent of the total. Some of them are engaged in research and product development, some in technology transfer and technical services, and some in a combination of technology and trade. Their ranges of operation are broad, being from computers, biologic technologies, automation, television, energy, mechanical engineering, and audio and optical technologies to agriculture, forestry, animal husbandry, foodstuffs, and culture and education, but are focussed on electronics and engineering. Walking from Baishiqiao to Zhongguancun Avenue, people can see all kinds of computer companies lining both sides, no less than 40 of all sizes, and so there is really a spirit of being an "electronics street." At present, publications not only within this country but outside it as well have reported on "the electronics street--Zhongguancun." Evaluations of the numerous companies are not uniform, there being both praise and blame. Some call them a new force in the restructuring of the science and technology system, and that they are "new flowers" blossoming at the point of the integration of science and technology with the economy; others say that they are "profiteering middlemen" or "fly-by-night companies." To correctly evaluate their position and function, with the help of the Beijing municipal science and technology commission and the Beijing Science and Technology

Management Research Center, this writer recently went to the Haidian district "electronics street" for a field investigation.

### They Have Created Astonishingly High Efficiency

Among the science and technology structures that are springing up, those that have been the most influential have been the firms "Sitong," "Xintong," "Kehai," and "Jinghai," and the most outstanding impression given to this writer by them was one of astonishing efficiency.

Based on an investigation of more than 100 companies by relevant departments, in just the 2 short years from 1984 until the early part of this year, they completed more than 3,700 technology development projects, 16 of which were at international levels, more than 200 were in the front ranks domestically or filled domestic voids, 6 were granted patents, and 27 won awards at the municipal level or higher. A sampling survey of 27 firms showed that after these achievements were applied by customers, they gained economic results of 29 million yuan, with indirect results in the hundreds of millions.

Some scientists and technicians have been at their units for many years without making any particular contributions, but when they come here it is one accomplishment after the other. When I asked about the reason for this, they said that in the past, science research was conducted in the closed systems of their former units, movements tended to be restricted completely, which in time becomes inertia and you lose that drive and creative spirit that dares to go on. Now, the majority of companies practice a responsibility system where "five things come from one agreement," and where they can "establish their own projects, organize freely, plan on their own, pay their own expenses, and find their own customers" based on market information. Movements are unrestricted, and on the stage that is the integration of science research with production they make the most of their intelligence and knowledge, and they radiate a great deal more light and heat than they had formerly.

Each year, the Sitong Company has had a key product enter the market. The M2024 they developed replaced the Japanese Toshiba TH-3070, and saved the state some \$9 million in foreign exchange. Scientists and technicians at the Kehai Center told this reporter with some pride that the pace at which their scientific and technical achievements are transformed is at least 2-3 times that of general science research units, and that each person makes a net contribution to the state of 13,700 yuan!

### Constitute Research and Production Enterprises of a Preliminary Scale

The public science and technology organizations on the "Zhongguancun electronics street" have often begun from the shifts to promote science and technology achievements. Later, as work developed, they found that the scientific and technical achievements provided them by the science research units were invariably of a rather low level, that they were not standardized, and that they needed development and "familiarization" before customers would accept them. What is more, the pace of development for new and high technologies has been astonishing, products have been updated and upgraded quickly, but it is still a situation where there is first science research,

then dissemination, where only because there is a "daughter" is a "husband's family" sought, which method can no longer meet the demands of the developments in science research and production. Thereupon, a group of qualified companies and centers began to prepare their own research and development departments and bases for trial production, and to get directly into product development. Because of their high intellectual make-up, together with their flexible mechanisms, their proper management, their implementation of unified information, research, development, production, marketing, and feedback, they could then quickly expand themselves in fierce competition, and go on to develop into R&D enterprises with individual characteristics.

This reporter visited the Jinghai Company, primarily engaged in computer technology development. This is a two-story building of some 2,000 sq m, and has no design office, new technology development section, maintenance department, computer section, or trial production line. Zhang Fu [1728 1788], assistant general manager and senior engineer at the company, told me that in July 1983 8 engineers the likes of Wang Hongde [3769 3163 1795], formerly a computer engineer at the Chinese Academy of Sciences and computer machine room specialist, started this company, and that it has now developed into a comprehensive specialized bloc of 18 branch companies. Over the last 3 years, they have not asked for one cent of state money, but have relied upon their own efforts to develop 12 new products and reach a production value of 120 million yuan. The "Jinghai" of today has more than 100 specialist technical personnel and a construction contingent, it can design, construct, supply peripheral equipment, install, debug, and maintain various computer rooms, control centers, and laboratories. A customer need only pick up a key, and he can then work under satisfying conditions, which has earned praise with the compliment the "key company."

#### Intellectual Entrepreneurs Are Springing Up

At the Kehai New Technology United Development Center, the 46-year old general manager Chen Qingzhen [7115 1987 2182] sat across from me, and described to the last detail his strengths and failures in operational decision making. He used to be an assistant researcher at the Chinese Academy of Sciences Physics Institute. On 4 May 1983, the Kehai New Technology United Development Center was established, and Chen Qingzhen rushed to take up his post, selecting the responsibilities of the general manager. The "Kehai" of that time had only 3 rooms, no more than 7 persons, and only 100,000 yuan of funding borrowed from the Haidian district. Starting a business is difficult, so what should the first step be that would determine its fate? Relying on their specialist knowledge, Chen Qingzhen acutely foresaw from the market information that kept pouring in a wave of microcomputer applications on the industrial front of this country. Through repeated discussions and a unanimous understanding, "Kehai" resolutely made its decisions: they borrowed 2.4 million yuan to develop research into the bringing of Chinese characters to computers and industrial computerized automated control technologies. In a year, as the tide of microcomputer usage rose in this country, "Kehai" already had strong technical preparations, they were successful at every attempt, and prospects for Chen Qingzhen and the others at the beginnings of their careers were opened up!

In fact, on "electronics street" there are far more than just one of entrepreneurs like Chen Qingzhen. Wan Runnan [8001 3387 0589] of the Sitong Company, Wang Hongde of the Jinghai Company, and Jin Yanjing [6855 3601 7234] of the Xintong Company are all expert heads of operations, who understand science and technology and are good at operations. They have both the spirit of participation and also management ability, their information is effective, what they see and hear is vital, they are bold and knowledgeable, their decision making is quick and accurate, and they are bold explorers for the restructuring of the science and technology system. It was under their motivation and influence that a group of scientists and technicians dedicated themselves to this new undertaking, and have developed the aspect of the "electronics street" of today.

Naturally, these new types of scientific and technical organizations are not without problems. I realized during my investigations that among these scientific and technical structures there are those that have hung out the sign of science and technology but are engaged in purely commercial or purely production activities. Their internal management is in confusion, and there are holes in their finances and statistics, and some have closed up shop, moved away, joined with others, and separately established themselves, all without following procedures or even being public about it. But this is certainly not the mainstream. Within a large restructuring, it is not the least surprising that this and that problem will arise. Even for science and technology structures that are well run, they themselves need a process of continued practice, exploration, and constant improvement. As long as we adopt a positive attitude, provide help, support, and enhance management, all these problems are solvable.

12586

CSO: 4008/2040

## NATIONAL DEVELOPMENTS

### JILIN SCIENTISTS WIN NATIONAL-LEVEL HONOR

SK260601 Changchun Jilin Provincial Service in Mandarin 2200 GMT 25 Jan 87

[Excerpts] With the coming of the Spring Festival, 10 scientific and technological personnel in Jilin have been named outstanding national-level experts with the approval of the State Science and Technology Commission. At present, the province has 21 outstanding national-level experts, an increase from 11.

On the afternoon of 25 January, leading comrades of the provincial party and government organs, including Gao Di, Gao Dezhan, Wang Daren, Zhao Xiu, Zhang Fenggi, and Du Qinglin, received the representatives of outstanding intellectuals from the industrial, agricultural, scientific research, educational, and public health sectors at Nanhu Guest House.

During the meeting, Comrade Gao Di said: All of you present here have the honor of being named outstanding national-level experts by the State Science and Technology Commission. This is your honor and the honor of Jilin. You have set examples and pointed out the direction of endeavor for the broad masses of intellectuals throughout the province.

Comrade Gao Di said: Now is the best time for economic, scientific, and technological development since the founding of the PRC as well as the time for the broad masses of intellectuals to feel at ease, to display their talent, and to make great contributions to the country. It is also a time for making progress, fostering competent personnel, producing more products, and achieving more economic results. I hope that the broad masses of intellectuals across the province will treasure this excellent situation and take the lead in upholding the four cardinal principles and consolidating and developing the good situation of stability and unity, and will promote the spirit of pioneering one's cause through hard work and thrift and make new and outstanding contributions to making Jilin prosperous.

/8309

CSO: 4008/2050

## NATIONAL DEVELOPMENTS

### SPARK PLAN MEASURES IN JILIN REPORTED

Tianjin JISHU SHICHANG BAO in Chinese 12 Aug 86 p 3

[Text] The Jilin provincial government recently formulated "Temporary Regulations About the Implementation of Some Policies To Carry Out the Spark Plan" to ensure its implementation.

The regulations stress that in any item related to the spark plan, ordered by the provincial, municipal, district, prefecture, or county S&T units, or in the transfer of technology results from S&T design units, universities, or engineering or mining enterprises to middle-size and small or rural enterprises, a technology contract must be signed. Parallel contracts can, according to the will of the parties related, be made, notified, and reported to their local or county S&T committee and the administrative department of the enterprise for future reference. If any dispute happens, it should be mediated by the related authority and if the mediation fails, it shall be handled according to the legal procedures.

The regulations put forward state that a technology-intensive unit, when transferring or offering its technology results or technology services to a rural enterprise, should stress low payment, and the remuneration should be decided by the two parties through negotiation. In technology result transfers from an S&T research unit, university, or engineering or mining enterprise to a rural enterprise, a royalty of 10-15 percent of the net profit may be accepted, and in technology services, 50 percent. This will be used to award the people who rendered great service and this award money shall not be listed in the total amount of award of that unit.

The regulations also put forward that college or professional school graduates assigned to a rural enterprise by the state will have their probation period cancelled and their wage shall be raised two steps. After working for 5 years in a rural enterprise, their wage may become a fixed wage. When S&T personnel are sent to a rural enterprise supported by their unit, their original technical position and payment shall be kept and the unit being supported may issue some proper award according to their work. Technology results acquired by S&T personnel in rural enterprises shall be listed in the record for personal work performance assessment. If S&T personnel initiate applications to work in rural enterprises, their technical positions shall be kept and after 5 years of continuously working, they may return to the city with some new assignment.

The regulations also include regulations about the raising of capital, material supply, taxation, product prices, and awards for spark plan projects. Banks at different levels must support the policy according to loan principles. Financial authorities at all levels shall appropriate special funds to be used in subsidizing loan discounts for spark plan projects; fund-raising from the public, staff and worker investment, or member investment can be adopted. The state ration resources needed shall be put into the national economic plan at different levels and supplied accordingly. When an item is put into production, a tax shall be paid according to the regulation. Those with real difficulties may apply to the taxation authority and the approval, reduction, or exemption may be granted for a certain period of time. The reduction and exemption shall be kept for the enterprise for technology development capital. For spark plan projects with obvious economic results, after approval from the provincial S&T committee, 3-5 percent of the profit acquired within a year since its production may be used for awards to encourage the meritorious persons or units.

12909/6091

CSO: 4008/2004



## NATIONAL DEVELOPMENTS

### NATIONAL FORUM ON S&T REFORM HELD IN SHENYANG

SK060428 Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 5 Jan 87

[Text] A national forum on reform of the scientific and technological system attended by some cities was held in Shenyang today. Zeng Xianlin, vice minister of the State Science and Technology Commission, pointed out at the forum: The focus of our country's reform of the scientific and technological system this year will be placed on delegating power to scientific and technological institutes and scientific and technical personnel to invigorate them, and on relaxing policies and control.

All government departments should delegate power to scientific research institutes, separate government administration from research jobs, and, through lateral cooperation, gradually achieve various forms of coordination between scientific research and production. Scientific research institutes with poor management and economic results should also be leased or contracted out. Some large research institutes may be divided into several parts, then leased or contracted out. To make a success of the focal points of the reform, we should abandon protectionism and the concept of grading scientific research institutes, free scientific and technical personnel from the idea of feudal literati and officialdom, and break with the ideas of asking for money from the state, egalitarianism, and the common pot in distribution, and end the convention of waiting for the state to assign tasks and plans.

Leading persons of 11 cities, including Beijing, Tianjin, Shenyang, Guangzhou and Xian, and responsible persons of relevant state ministries, commissions, and departments attended the forum. A leading official of the Shenyang City government introduced the city's experiences in reform of the scientific and technological system.

/6662

CSO: 4008/2058

## NATIONAL DEVELOPMENTS

### SCIENCE DEVELOPMENT IN SHENZHEN REPORTED

Tianjin JISHU SHICHANG BAO in Chinese 5 Aug 86 p 1

[Text] On entering the Shenzhen special zone one is greeted by highrises and lowrises and modern buildings rising up into the clouds. In as short a period as 6 years, there has emerged an embryo of a modern city out of the void. The construction of Shenzhen has, in the past few years, attracted the attention of people both in and out of the country. In the same mood, I arrived at Shenzhen to report. If Shenzhen is compared to a newly built building, then how is the internal construction work proceeding? As a base of urban industrial development, how is the S&T development there?

I luckily met Comrade Ye Minhui [0673 3046 6540], director of Shenzhen S&T development center, who graduated from Huanan Engineering College, around 30 years old, intelligent, and capable. He has confidence in the future of the Shenzhen special zone. He told me in detail the conditions of S&T work in Shenzhen with emphasis on the function of Shenzhen as a "window" to improve the development of technology and the economy of our country.

#### Stressing, Recruiting, Growing

Six years ago, S&T and industrial production in Shenzhen and the city were insignificant. At that time, Shenzhen had a population of about 30,000 and only 300 S&T personnel with an educational level of about college. At the beginning of the construction of Shenzhen special zone, they needed first to use its natural conditions to improve business and tourism to attract foreign businessmen and accumulate capital to lay the foundation for the development of the city, industry, agriculture, and production. So, several years ago, what appeared first in Shenzhen was tertiary industry. The rise of business and tourism attracted some companies to invest there. After 1982, Shenzhen established its handcraft industry and reprocessing in electronics and light textiles, which were the embryo of Shenzhen. The ambitious Shenzhen people were not satisfied with this kind of low standard reprocessing production, and to change that situation, they needed S&T. Mayor Li Hao [2621 3493] said that the key to making Shenzhen a "window" is S&T. In the past 2 years, S&T development in Shenzhen has been stressed more and more.

Under the guidance of the central government, Shenzhen's industry developed further toward "the outside," that is, to attract more foreigners to invest

and expand joint ventures, pay more attention to introduce foreign and inland technology, raise the standard of skill, upgrade industrial products, and strive for 60 percent of products produced to be exported to foreign countries to balance foreign exchange.

Following the improvement of an environment for foreign investment and the stressing of S&T, the appearance of industry in Shenzhen has been greatly improved over 2 years ago. Last year, in overall economic income, industrial output reached first place, which amounts to 2.67 billion RMB, with 300 enterprises and 800 kinds of products. The export of industrial products stands at 40 percent of the total products sold, including electronics, textiles, light industry machines, construction materials, petrochemicals, and food. Industry has gone from reprocessing to the creative stage of introduction, research, digestion, and development.

The Shenzhen S&T contingent grew rapidly in the past few years. Through many channels, they improved their S&T strength, such as uniting with S&T units in the interior, training, and recruiting to attract S&T personnel to help in the construction in Shenzhen and strengthen its S&T force. By the end of last year, the S&T contingent in Shenzhen had developed to 16,000 people; among them 500 have a high position or title. Their level of education is already higher than an ordinary city. The recruitment of young specialists with outstanding contributions in the past years and the selection of S&T personnel for further training are also stressed. Awarded and praised are those with results in S&T research, contributions in S&T management, a pioneering spirit, and economic results in the application of new technology. Examples are the inventors of the single- or double-color roller printing press, and the Three Well Brand oyster oil, such as middle-aged and young S&T personnel Chen Jinsheng [7115 6855 0524] and Lin Songqing [2651 2646 7230], who both were awarded with the first place S&T award and were promoted to leading posts. Shenzhen S&T personnel are growing in an atmosphere of respect for knowledge and talent.

#### Start With "Domestic Joint Cooperation" To Surpass Hong Kong

The special zone is a fine place in the country to put S&T results into production and to export to acquire foreign exchange. For several years, a great number of S&T results from the interior have been applied with obvious economic results, such as the smoke detector designed by Harbin Industrial University, which cooperated with a company in Shenzhen to manufacture it and exported it through Hong Kong. It has a good reputation and has become one of the finest products. The LCD display screen and the large monitor designed by Hangzhou University also were cooperative projects with a company in Shenzhen and, when put into production, became one of the important export products; the all-plastic minicar, an invention of our country, has been put into production for export; the sour milk (yogurt) designed by the Tianjin Light Industry College, which was unable to be put into production in the interior, has become an important product for export; and there are also soybean milk, various drinks, etc., which are all from the S&T research results and technology which flourished in Shenzhen. It seems that there is a great future for technology from inland to come to Shenzhen to be put into

production. The reason is that Shenzhen has its unique features of having the interior at its back and Hong Kong to its front. It has more favorable conditions than Hong Kong in the utilization of resources, technology, labor, and markets in the interior and has more favorable conditions than the inland area in using Hong Kong to acquire information about S&T, finance, and trade. The people of Shenzhen think that the level of S&T and design in the interior is higher, yet owing to the factor of their inability to put the raw material into sets, they cannot be put into production in time. In Shenzhen, materials used in electronics, machinery, light textiles, and food are tax free; the key is the ease of acquiring materials, which has resulted in low cost, shorter cycles, and the easy export of products.

In the past few years, there have appeared numerous "domestic joint" units, that is, S&T or production units from the interior send personnel to cooperate with companies in Shenzhen or with foreign companies and the products they develop are exported through Hong Kong and acquire obvious economic results. Thus it has improved the development and application of the new technology from the interior and opened a new road for the growth of S&T in Shenzhen.

Using foreign capital and introducing appropriate advanced technology are other important roads for the development of S&T and industrial production. The first S&T park in our country, Shenzhen S&T industrial park, is also a joint venture based on S&T from the interior.

#### Window To Export Technology

I read from related informational periodicals that the industrial circles in Hong Kong are concerned with the application of S&T results from the interior to raise their productivity and standards of technique. The manager of the "Beijing and Hong Kong Academic Exchange Center" said: "The whole system of industry in Hong Kong has a certain foundation, yet the S&T research is weak... while S&T research in the interior is supported by the state and has cultivated a great number of S&T talent. There are no national boundaries in S&T. If the results from the interior are not put into production rapidly, their creativity will be lost. Technology transfer from the interior to Hong Kong can bring about favorable conditions for Hong Kong's development and also open up new roads for S&T results from the interior." This talk reflects the demand of Hong Kong's industry for technology from the interior. Shenzhen "S&T development center" saw this trend and organized technology exchange fairs many times to attract foreign companies and, through this window, to let our advanced technology cross the border of our country to create wealth for mankind. The newly opened "Shenzhen technological merchandise exchange" will contribute to the development of the technology market in Shenzhen. They already started handling technology transfers and technological services. They praised our newspaper for gathering technological information and will cooperate with our newspaper to contribute to the development of the technology market in our country.

12909/6091  
CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### PRC STUDENTS STUDY IN HONG KONG DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 23 Aug 86 p 4

[Text] The Chinese-born British professor from the Birmingham Computer Research Center, Wu Boxiong [0702 0130 7160], in an interview with this reporter, praised the Chinese students studying in England as hard working and determined to return to China to contribute after finishing their studies.

Wu pointed out that it is different from a few years ago; Chinese students recently sent to England are young (the majority are 17-30 years old), open-minded, and eager to explore. He said that these students came from all over China. It is different now from the past, when the students were older (about in their forties) and the majority were limited to the big cities in the south. This shows that the new generation of talented people is growing.

Professor Wu said that there are 70 Chinese students at Birmingham University and all study hard and are thought of highly by their advisers.

Wu graduated from Xiamen University where he majored in physics in the 1950's. He moved to Hong Kong in the 1960's and was hired as an instructor at the University of Hong Kong. In 1966 he went to England to study physics at London University and Birmingham University and won his PhD and started his scientific research in the computer research center.

Wu told the reporter that in addition to a great number of Chinese students from the mainland, there are still many from Taiwan and Hong Kong and Chinese descendants from Singapore and Malaysia. He noticed that the students from both sides of the Taiwan Straits study hard and they get along well.

12909/6091

CSO: 4008/2004

## NATIONAL DEVELOPMENTS

### BRIEFS

GANSU SYNTHETIC RUBBER--Beijing 11 Nov (XINHUA)--A research center of the technology of synthetic rubber, the first of its kind in China, was set up in Lanzhou, Gansu Province, last Saturday. Backed by the China Petrochemicals Corporation, the center will mainly plan, organize and coordinate scientific research work. [Text] [Beijing XINHUA in English 0216 GMT 11 Nov 86 OW] /6662

RURAL DRUG INSPECTION INSTITUTES--Beijing, 17 Nov (XINHUA)--About 1,200 drug-inspection institutes have been set up in China's countryside since the "Law on Pharmaceuticals Control" came into effect July 1985. This was released at a national work meeting which closed yesterday in Dalain, a coastal city in Liaoning Province, today's QUANGMING DAILY reported. Nearly 60 institutes were cited for good performance by the Ministry of Public Health at the meeting. The paper said these institutes, with 6,000 staff members, play an important role in rural health care. [Text] [Beijing XINHUA in English 0819 GMT 17 Nov 86 OW] /6662

FOREIGN COOPERATION IN PETROCHEMICAL INDUSTRY--Beijing, 31 Dec (XINHUA)--The year of 1986 has seen China more active internationally in the petrochemical industry, ending the year with 52 Sino-foreign contracts having been signed on economic and technical cooperation, said a high official. Chen Jinhua, general manager of the China Petrochemical Corporation, told a meeting of managers of subordinate enterprises today, that his corporation has established contacts with more than 300 enterprises and banks from 46 countries and regions as of the end of the year. During 1986, he said, sixteen Sino-foreign joint ventures were set up and 720 foreign specialists were invited to work in China. The corporation has also been engaged in offsetting trade, labor export, using supplied material for processing, leasing and other Sino-foreign business, said general manager Chen. The corporation has maintained exports this year in spite of the sharp drop in price of oil on world markets, said Chen. It has exported 5.9 million tons of oil earning 850 million U.S. dollars in 1986. General manager Chen said, more efforts should be taken to enhance the quality of petroleum by-products and to develop new varieties. This, he says, will help make China's petrochemical enterprises and their products more competitive on world markets. [Text] [Beijing XINHUA in English 1035 GMT 31 Dec 86 OW] /6662

PETROCHEMICAL INDUSTRY EXPECTS EXPANSION--Beijing, 2 Jan (XINHUA)--Output value of China's petrochemical industry this year is planned to reach 33 billion yuan (8.9 billion U.S. dollars), seven billion more than last year. The projection was announced by Chen Jinhua, president of the China Petrochemical Corporation, at a national meeting now in session in Beijing. "The industry also will increase profits to 15.8 billion yuan (4.3 billion U.S. dollars), up from last year's 15 billion yuan (4.1 billion U.S. dollars), and plans exports of 5.4 million tons of oil products," he said. He told enterprise managers attending the meeting, "Construction investment will also increase, and during the year, first-phase projects for two petrochemical complexes, each with an annual production capacity of 300,000 tons of ethylene and 22 other production projects will be completed." "To reach the goal," the president said, "greater effort must be made to further improve management skills, to promote scientific research work and to enhance both domestic and foreign cooperation. A sharp drop in oil prices on the world market had adverse effects on China's petrochemical industry last year, but the situation also provided a chance for the industry's development," Chen said, adding China now has more crude oil to produce petrochemical commodities urgently needed domestically. [Text] [Beijing XINHUA in English 1437 GMT 2 Jan 87 OW] /6662

IMPROVEMENTS IN MEDICAL WORK REPORTED--Beijing, 3 Jan (XINHUA)--Last year saw great improvements in China's medical work both in urban and rural areas, according to the journal, HEALTH NEWS. To make better use of medical equipment, personnel and hospital beds, cooperation has been tightened among both city hospitals and between rural and urban hospitals, the paper said. A system of home visits by personnel attached to hospitals has been formed around the country. At present, China has one million such persons confined to bed in their homes and visited by hospital workers, according to the paper. According to statistics, more than 117,000 Chinese individual practitioners have opened their own businesses and 21 hospitals with about 1,000 beds are sponsored by them. Last year, more than 10 medical research items, including therapy to cure kidney stones without surgery, won prizes from the Ministry of Public Health, according to the paper. Medical work in rural areas has also improved, with some county hospitals able to perform some difficult operations and clinics established in all villages, the paper said. Recent developments include advances in convalescent care, geriatrics and mental health, the paper said. [Text] [Beijing XINHUA in English 1156 GMT 3 Jan 87 OW] /6662

IMPORTED ELECTRONIC PRODUCTS INSPECTION--Beijing, 9 Jan (XINHUA)--China's State Administration of Commodity Inspection conferred a certificate today to the No 3 Institute of the Ministry of the Electronics Industry making the institute China's inspection laboratory for electronic products. The lab will make quality control inspections on radios, television sets and acoustic products such as tape recorders and tapes. Zhu Zhenyuan, deputy head of the institute, said that the State Administration should fully utilize domestic inspection agencies in the industry, transportation, scientific research, culture and education departments to form a national system of goods inspections for import and export. "By doing so, we can meet the demand of all imported and exported goods which require inspection." According to Zhu, 21 Chinese ministries, commissions and bureaus have recommended the State Administration of Inspection set up 248 specialized inspection laboratories. [Text] [Beijing XINHUA in English 1601 GMT 9 Jan 87 OW] /6662

METEOROLOGICAL SATELLITE LAUNCH PLANS--Beijing, 18 Jan (XINHUA)--China will launch its first meteorological satellite and build six local centers and four monitoring experimental bases in 1986-90, sources here said today. To launch a meteorological satellite will help change the situation of monitoring the atmosphere by means of ground detection network. China has in the main set up three ground meteorological data receiving stations in Beijing, Guangzhou and Urumqi. Construction of a data processing center is also under way. [Text] [Beijing XINHUA in English 0705 GMT 18 Jan 87 OW] /6662

INTEGRATED CIRCUIT PRODUCTION--Beijing, 21 Jan (XINHUA)--Today's economic news briefs: More integrated circuits. A production line manufacturing integrated circuits has been installed at the Beijing Electron Tube Plant. The line is expected to produce silicon chips used in electronic equipment and color televisions, and the factory will produce both large integrated circuits, and mini-chips, which previously had to be imported. [Excerpt] [Beijing XINHUA in English 0907 GMT 21 Jan 87 OW] /6662

ELECTRONICS LEASING COMPANY ESTABLISHED--Beijing, 24 Jan (XINHUA)--A nationwide electronics leasing company, the first of its kind in China, was set up here today. Jointly organized by the China National Electronics Import-Export Corporation and the Bank of China Trust and Consultancy Company, the China Electronics Leasing Co. Ltd. handles communications equipment, instruments and meters, electronic machinery and spare parts. The company also undertakes leasing-related compensation trade and cooperative production projects and handles trust investment and deposits on behalf of customers. President Dong Yingjie of the company said, "My company will import advanced equipment to help upgrade the country's electronics industrial enterprises." [Text] [Beijing XINHUA in English 0755 GMT 24 Jan 87 OW] /6662

COMPUTER TECHNOLOGY COMPANY PROFITS--Beijing, 4 Feb (XINHUA)--How eight engineers are running a successful computer technology company is described in a frontpage article in today's GUANGMING DAILY as a good example of the reform in China's science management set-up. The Jinghai company, set up in September 1983 by the group who resigned from the Chinese Academy of Sciences, now has 18 branches, including two joint ventures. It has yielded 120 million yuan in output value, the paper says. Without using state investment or bank loans, it has relied on the ingenuity of its staff for development. So far it has built 260 computer centers for different trades in various areas, the paper says. The organization has 2,000 regular Chinese clients including government departments, schools and industrial enterprises, and has established relations of cooperation with firms in Canada, Federal Germany, Italy, Japan, Singapore, the United States and Hong Kong, the paper adds. "Once technology is 'released' from research institutes, it will be able to generate great economic benefits," the paper quotes a company leader as saying. The on-going reform in the science management system allows research workers to resign from overstaffed research institutes and start technological development projects of their own. Some of the eight engineers used to work at the Computing Technology Institute of the Chinese Academy of Sciences, and the others are the Academy's Computer Center. [graf as received] [Text] [Beijing XINHUA in English 0758 GMT 4 Feb 87 OW] /6662



NATURAL SCIENCE FOUNDATION FINANCIAL AID--Beijing, 24 Dec (XINHUA)--The State Natural Science Foundation (SNSF) has provided 3,432 research projects this year with financial aid totalling some 95 million yuan (about US\$25.65). This year the foundation committee has received 12,000 applications for financial aid. A total of 40 appraisal groups were formed comprising 475 experts, to make sure that the aid is channelled to projects needed for the country's economic construction. The foundation committee has also cooperated this year with the committee of urban and rural construction in financing 21 research projects in the fields of construction, environmental protection and structural engineering. [Text] [Beijing XINHUA in English 1152 GMT 24 Dec 86] /8309

RESEARCH INSTITUTES BECOME MORE SELF-SUPPORTING--Beijing, 5 Feb (XINHUA)--About 10 percent of the 400 applied science research institutes under the central departments have become economically self-sufficient, the GUANGMING DAILY reported today. This is due to the success of self-supporting projects they carried out last year in line with new state regulations. Taking the 400 as a whole, state funding dropped to 38 percent of their total expenditure last year, and their income from scientific application contracts rose to around 30 percent. Last year, the State Council started reforming the funding of research units by introducing the responsibility system and contracting out research projects. China's provinces, municipalities and autonomous regions have almost completed classification of their research units in order to introduce different funding systems. [Text] [Beijing XINHUA in English 0714 GMT 5 Feb 87 OW] /6662

TIANJIN SCIENTIFIC RESEARCH RESULTS SUCCESSFUL--Tianjin, 15 Dec (XINHUA)--Scientists have made great achievements in their research work this year in Tianjin, one of the three municipalities directly under the central government. "So far, we have achieved outstanding results in 319 projects with four of them being world firsts and 27 comparable with international advanced levels," said Chen Minghua, an official of the city's Commission of Science and Technology. The breakthrough achievements include two in the medical field and two in industrial areas, he said, adding that most of the achievements have already been applied to practical production. He attributed the successes to a contract system which defines clearly the duties, interests and other aspects concerning the parties concerned. Scientific research institutes get loans from banks to support the research work rather than using funds allocated by the government, as was the previous practice, he said. To encourage scientists and researchers, the municipal government holds meetings every year specially to praise and reward those scientists who have made outstanding achievements in their work, he said. [Text] [Beijing XINHUA in English 0301 GMT 15 Nov 86 OW] /6662

SICHUAN TECHNICAL WORKERS HELP BOOST OUTPUT--Chengdu, 8 Dec (XINHUA)--More than 100,000 technical and managerial workers are now making special efforts to boost production in Sichuan Province, according to an official from the local government. They work in small, medium-sized and rural enterprises by providing technical services and consultancy, the official told XINHUA. To implement a national plan to spread practical techniques in the countryside, 24 colleges and universities, 40 military-related industries and some research

institutes have offered technical services to more than 2,900 such factories. The Sichuan Provincial Association for Science and Technology has established offices at different levels to provide technical consultancy to more than 16,000 local and rural enterprises. Their services helped improve economic results by 960 million yuan (about U.S.\$260 million) last year. According to statistics, the total output value of rural enterprises in Sichuan accounted for 18.5 percent of the province's total industrial and agricultural output value last year. [Excerpt] [Beijing XINHUA in English 0123 GMT 9 Dec 86 OW] /6662

HIGH-TECH DEVELOPMENT LABORATORIES PLANNED--Beijing, 5 Jan (XINHUA)--During the next five years, China will build 50 key laboratories to facilitate high-tech development, according to the SCIENCE AND TECHNOLOGY DAILY. "These labs will emphasize basic studies and preparatory research work in the applied sciences," the paper said, adding the labs will be equipped with the most advanced instruments available and will maintain the highest levels in research and management. During the Sixth 5-Year Plan (1980-85), China allocated special funds for 20 labs and approved completion of its first key lab, the Shanghai Molecular Biology Laboratory under the Chinese Academy of Sciences last month, according to the report. Like the Shanghai lab, the new labs will be staffed with program directors, technicians and management personnel and open to visiting scholars for research for terms of one to three years, the report said. [Text] [Beijing XINHUA in English 0715 GMT 5 Jan 87 OW] /6662

FIRST UNDERWATER ROBOT--Beijing, 20 Dec (XINHUA)--China's first underwater robot, HR-01, worked efficiently on Thursday at a depth of 199 meters beneath the South China Sea. The robot was designed to dive to 200 meters. An expert in charge of the trial operation told XINHUA that since the robot was manufactured by the Shenyang Automation Institute a year ago, improvement have been made to the 2.5-ton device. "All the components in the robot worked well and the data it transmitted back is reliable," he said. Under the control of technicians on board a ship, the machine moved back and forth, up and down, and collected objects on the sea bed, he said. It was transported recently to the south from the northern port city of Dalian after trials there. "The robot has reached the technical standards of similar robots of other countries," the expert said. [Text] [Beijing XINHUA in English 1328 GMT 20 Dec 86] /8309

CSO: 4010/2006

## PHYSICAL SCIENCES

### IMAGE ENCRYPTION PROBLEMS DISCUSSED

Beijing JISUANJI YANJIU YU FAZHAN [COMPUTER RESEARCH AND DEVELOPMENT] in Chinese Vol 23 No 5, 1986 pp 34-38, 33

[Article by Zhou Tongheng [0719 0681 5899], Computer Technology and Research Department, Chinese Academy of Science]

#### [Text] I. Introduction

In number-based communications, image encryption is an important problem. Because of the large amount of data contained in an image, and because the required rate of encryption is high, general cypher systems are not suitable. Many methods have been proposed to solve this problem and approach the goal of image encryption either by using rapid output of pseudorandom arrays to cover the image or by utilizing the characteristics of the image itself, using the method of a picture element address change as an image cypher system.

One image encryption method is proposed in the paper "A Method of Image Encryption."<sup>1</sup> We discuss the security aspects of this method of image encryption below.

#### II. Discussion of "A Method of Image Encryption"

An image encryption method of scrambling the picture element addresses is proposed in the paper "A Method of Image Encryption." Its main steps are as follows:

For an image with an  $n \times m$  matrix, we randomly select two arrays  $\{S_j\}$ ,  $\{R_i\}$ ,  $1 \leq i \leq \max(n, m)$ ,  $1 \leq j \leq m$ , and also  $\{S_j\}$  is the set  $(1, \dots, m)$ .

The first step is to carry out the cyclic transposition of picture element columns. For example, for  $R_1 = 207$ , starting with the original image, the element in address  $(i, 207)$  carries out transposition to  $(i, 1)$  and, following this element, carries out cyclic transportation on the remainder of the elements in column  $i$ . After random cyclic transposition has been performed on each picture element column in the original image, we obtain image A.

Step 2: Carry out the random scrambling of all picture element rows. For example,  $S_1 = 063$ , starting with the 63d row of image A without changing the column addresses, place them in row 1. After performing this kind of row scrambling on image A, we obtain image B.

Step 3: Carry out the random cyclic transposition on row picture elements. For example, if  $R_1 = 207$ , starting with the elements in address  $(207, i)$  of image B, carry out cyclic transposition on the remainder of the elements in row  $i$ . After this kind of random cyclic transposition of all elements in image B, we obtain the encrypted image C according to this method.

It is considered that the interrelationship among picture elements of encrypted image C and the original image to be totally destroyed.

Below, we discuss the security aspects of this type of image encryption method. We will use formulas to indicate the aforementioned measures.

We use  $G$  to indicate the original image. Since there is no relation between the image content and the encryption method, we regard image  $G$  as an  $n \times m$  matrix.

We set up  $E_1$  as the transformation function for the random cyclic transposition of column picture elements,  $E_1: Z_{n \times m, n \times m} \times Z_{m, m} \rightarrow Z_{n \times m, n \times m}$ .

$$E_1(G, \{R_i\}) = A$$

where  $A = (a_{ij})$  is an  $n \times m$  matrix,

$$a_{ij}' = g_{ij}, \text{ and}$$

$$j' = j - R_i + 1 \pmod{m}$$

Going through the transformation  $E_1$ , the coordinate points  $(i, j)$  of  $G$  are changed to points  $(i, j')$  of  $A$ .

We set up  $E_2$  as the transformation function for the random scrambling of rows,  $E_2: Z_{n \times m, n \times m} \times Z_{m, m} \rightarrow Z_{n \times m, n \times m}$ .

$$E_2(A, \{S_i\}) = B$$

where  $B = (b_{ij})$  is an  $n \times m$  matrix,  $b_{ij}' = a_{ij}$ , and  $j' = S_j$ .

Going through the transformation  $E_2$ , the points  $(i, j)$  in  $A$  are changed to the points  $(i, j')$  in  $B$ .

We set up  $E_3$  as the random cyclic transposition function for rows,

$$E_3: Z_{n \times m, n \times m} \times Z_{n, n} \rightarrow Z_{n \times m, n \times m}$$

$$E_3(B, \{R_i\}) = C$$

where  $C = (c_{ij})$  is an  $n \times m$  matrix,  $c_{i'j} = b_{ij}$ , and  $i' = i - R_j + 1 \pmod{n}$ .

Going through the transformation  $E_3$ , the coordinate points  $(i,j)$  in image  $B$  are changed to points  $(i,j')$  in  $C$ .

We set up the transformation function  $E$  as:

$$\begin{aligned} E(G) &= E_3(E_2(E_1, \{R_i\}), \{S_i\}), \{R_i\}) \\ &= C \end{aligned}$$

$$c_{i'j'} = g_{ij}$$

where  $r = j - R_i + 1 \pmod{m}$ ,

$$i' = i - R_{Sr+1} \pmod{n},$$

$$j' = S_r$$

Because  $E_3(E_2(A_1\{S_i\}), \{R_i\}) = C$

therefore  $c_{i'j'} = a_{ij}$

$$i' = i - R_{sj} + 1 \pmod{n}$$

$$j' = S_j$$

The two points  $a_{i_1j}$ ,  $a_{i_2j}$  in the same row of image  $A$  change to the two points  $c_{i'_1j'}$ ,  $c_{i'_2j'}$  still in the same row in image  $C$ .

$$j' = S_j$$

$$i'_1 = i_1 - R_{sj} + 1 \pmod{n}$$

$$i'_2 = i_2 - R_{sj} + 1 \pmod{n}.$$

Thus,  $i_1 - i_2 = i'_1 - i'_2 \pmod{n}$ .

From this point, we could start to search for weak points in image  $C$ .

Assume that the original image  $G$  is not a too complicated, black and white natural image. We use  $f(g_{ij})$  to indicate the point gamma of point  $g_{ij}$ . The point gamma curve of the image point of the  $i$ th column is a step curve as in Figure 1. Assume that the  $i$ th column of the point gamma curve has  $K_i$  discontinuities. Going through the first step of random cyclic transposition of image  $A$ , the point gamma curve of the  $i$ th column has at the most  $K_i + 1$  discontinuity points as in Figure 2.

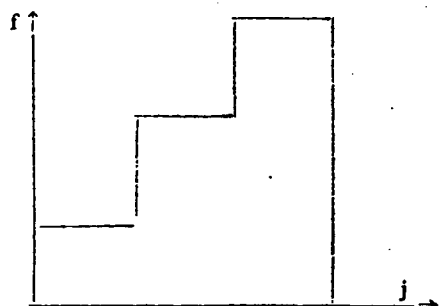


Figure 1. Point Gamma Curve of Column i (Image G)

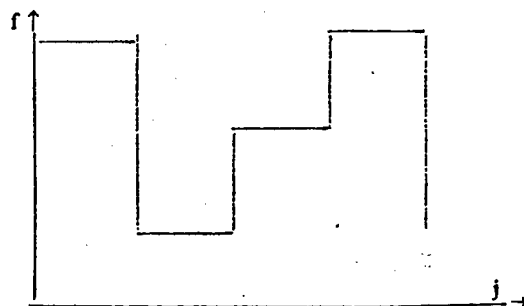


Figure 2. Point Gamma Curve of Column i in Image A

In image A, the probability of a difference in the point gamma between two adjacent points in the  $i$ th column becomes  $\frac{K_i+1}{n}$ .

In image A, the change between two adjacent rows is not large, and we set up function  $\epsilon$  as:

$$\epsilon(a) = \begin{cases} 0 & \text{if } a \leq K \\ 1 & \text{if } a > K \end{cases}$$

where  $K$  is a constant.

The point in the  $i$ th column and  $j$ th row of image A becomes  $a_{ij}$ , its point gamma becomes  $f_1(a_{ij})$ .

We define distance,  $S$ , between the  $i$ th and  $j$ th row of image A as

$$S(j_1, j_2) = \sum_{e=1}^n \epsilon(|f_1(a_{ej_1}) - f_1(a_{ej_2})|)$$

Since the discontinuity in the point gamma curve in the  $i$ th column is small, therefore

$$\begin{aligned} \sum_{j=1}^{n-1} S(j, j+1) &= \sum_{j=1}^{n-1} \sum_{e=1}^n \epsilon(|f_1(a_{ej}) - f_1(a_{ej}+1)|) \\ &= \sum_{i=1}^n \sum_{j=1}^{n-1} \epsilon(|f_1(a_{ej}) - f_1(a_{ej}+1)|) \\ &\leq \sum_{e=1}^n K_e + n \end{aligned}$$

Thus obtaining a result of a small average value of  $S(j, j+1)$ , equal to

$$\frac{\sum_{i=1}^n K_i}{n} + 1, \quad \text{there are about } \frac{n}{2} \text{ pairs with a small average value for the distance}$$

between adjacent rows. If image G is not a very complex natural image, with not a large distance between adjacent rows, where there is a relatively long distance between adjacent rows, S is very difficult to determine, and unless by coincidence, S is generally very large. We can still define a difference in the distance between rows:

$$S(j_1, j_2, \dots, j_e) \\ = \sum_{r=1}^{e-1} S(j_r, j_{r+1}).$$

Also, the average value of  $S(j, j+1, \dots, j+1-1)$  becomes e times the value of the average of  $S(j, j+1)$ . After image A, through random row scrambling, has been transformed to image B, since the row sequences of images A and B are not the same, then the collective distance between adjacent rows is relatively large, then we can use a comparative method to find row pairs for which S is relatively small. These row pairs are possibly the adjacent rows of image A and then exploratory methods can again be used to restore image A. Thus, the relationship among picture elements of image B is not entirely destroyed.

After carrying out the third step of encryption, one random cyclic transposition having been carried out on each row, the relationship among picture elements is further destroyed, but there is still a latent relationship between rows.

In image C, we denote as  $C_j^i$  the result of a downward transposition to the  $i^{\text{th}}$  position in the  $j^{\text{th}}$  row. If image A has this quality, the collective distance between rows  $S(a_{j_1}^{i_1}, a_{j_2}^{i_2})$  in image A ( $a_j^i$  being the result of a downward transposition to the  $i^{\text{th}}$  position in the  $j^{\text{th}}$  row,  $S(a_j^i, a_{j+1}^i)$  is relatively small. Image C has undergone two transformations from image A; nevertheless, the collective distance between rows of image C,  $S(C_{j_1}^{i_1}, C_{j_2}^{i_2})$  is identical to that of image A,  $S(a_{j_1}^{i_1}, a_{j_2}^{i_2})$ . For the row  $C_j$  in image C, we can use the method of comparative distances between rows to find the group  $\{C_{j_1}^{i_1}, C_{j_2}^{i_2}, \dots, C_{j_e}^{i_e}\}$ , making  $S(C_j, C_{j_r}^{i_r})$  relatively small for  $1 \leq r \leq e$ . Then, again selecting two rows from  $\{C_{j_1}^{i_1}, \dots, C_{j_e}^{i_e}\}$ , for example,  $C_{j_1}^{i_1}, C_{j_2}^{i_2}$ , makes  $S(C_j^i, C_{j_1}^{i_1}, C_{j_2}^{i_2})$  relatively small, we again consider  $C_{j_1}^{i_1}, C_{j_2}^{i_2}$ , search for its adjacent rows, and finally consider the  $j^{\text{th}}$  row of image C, obtaining an estimate of image A':

$$A' = E_3(E_2(A, \{S_i''\}), \{R_i''\}).$$

If in  $\{S_i\}$ ,

$$j = S_\alpha$$

$$S''_i = S_\alpha + 1 = \alpha \pmod{m} \quad i = 1, 2, \dots, m$$

$$R''_i = R_j \quad i = 1, 2, \dots, m$$

or  $j = S_\alpha$

$$S''_i = S_\alpha + \alpha - i \pmod{m} \quad i = 1, 2, \dots, m$$

$$R''_i = R_j \quad i = 1, 2, \dots, m.$$

Image C is obtained from one random row scrambling of Figure A' (using array  $\{S\}$  and random cyclic transposition of the same line (using array  $\{R'_i\}$ , where

$$R'_i = R_j + R_i \pmod{n}; R'_j = 0;$$

$$S'_i = S_\beta$$

$$\beta = \alpha \pm i \pmod{m}$$

$$S'_j = j.$$

Thus, with only a correct estimate of image A', it is easy to find  $\{R_i\}$  and  $\{S_i\}$ .

The method described above may not be capable of decyphering each image encrypted by the method put forward in "A Method of Image Encryption." But it at least points out a few drawbacks of the security aspects of this type of encryption method. If images are intercepted which use similar coding keys to  $\{R_i\}$  and  $\{S_i\}$ , we can use a method like that in reference [3] to obtain accurate estimates of  $\{R_i\}$  and  $\{S_i\}$ .

In order to clear up the remaining relationships among picture elements in the aforementioned encryption method, we can make slight modifications to the method. We randomly select three arrays  $\{R_i\}$ ,  $\{S_i\}$ , and  $\{t_i\}$ . The encryption method is as follows:

- ① According to array  $\{R_i\}$ , carry out the random cyclic transposition of columns, obtaining image  $A$ .

$$A = E_1(G, \{R_i\})$$

- ② According to array  $\{S_i\}$ , carry out the random cyclic transposition of rows, obtaining image B.

$$\begin{aligned} B &= E_3(A, \{S_i\}) \\ &= E_3(E_1(G, \{R_i\}), \{S_i\}) \end{aligned}$$



③ According to array  $\{t_i\}$ , carry out the cyclic transposition of columns, obtaining image C.

$$\begin{aligned} C &= E_1(B, \{t_i\}) \\ &= E_1(E_3(E_1(G, \{R_i\}), \{S_i\}), \{t_i\}) \\ &= E(G, \{R_i\}, \{S_i\}, \{t_i\}) \end{aligned}$$

We very easily prove by example that varying E cannot give the two products  $E_1$  and  $E_2$  since the coding key cannot be shortened. Moreover, this method avoids the weak points of all the aforementioned encryption methods. Due to the space limitations of this work, we do not go into a detailed discussion of the security aspects of this method.

### III. Discussion of the Picture Element Address Scrambling Encryption Method

The picture element address scrambling method is actually a substitute encyphering method of cypher system. The analytical power of its cypher language is very poor. If we use the same cypher key to send out several images  $\{G_1, \dots, G_k\}$ , if just three of the encyphered images  $\{C_1, \dots, C_k\}$  are intercepted, we can easily decypher the coding key that was used and work out  $\{G_1, \dots, G_k\}$ .

$$\begin{aligned} C_1 &= E(G_1) \\ &\vdots \\ C_k &= E(G_k) \end{aligned}$$

where E indicates an arbitrary picture element scrambling function.

Let  $f_1, \dots, f_k$  be the point gamma functions for images  $G_1, \dots, G_k$  and  $f'_1, \dots, f'_k$  be the point gamma functions for images  $C_1, \dots, C_k$ .

If we use  $g_{ij}$  and  $c_{ij}$ , respectively, to indicate the center coordinate points  $(i, j)$  of  $G_1, \dots, G_k$  and  $C_1, \dots, C_k$ , since the same cypher key was used to change  $G_1, \dots, G_k$  to  $C_1, \dots, C_k$ , thus the center point,  $g_{ij}$ , of  $G_1, \dots, G_k$  shifts to the center point,  $c_{ij}$ , of  $C_1, \dots, C_k$ . Since we used a picture element address scrambling method, thus picture elements merely have their addresses changed. The point gamma has not undergone changes, that is:

$$f_r(g_{ij}) = f'_r(c_{ij}), \quad 1 \leq r \leq k.$$

Regarding  $G_1, \dots, G_k$ , the point gamma  $f_1(g_{ij}), \dots, f_k(g_{ij})$  of point  $g_{ij}$  forms an array. Similarly, in  $C_1, \dots, C_k$ , the point gamma  $f'_1(c_{ij}), \dots, f'_k(c_{ij})$  of the point  $c_{ij}$  also forms an array. We distinguish by noting:

$$\begin{aligned} F(g_{ij}) &= (f_1(g_{ij}), \dots, f_k(g_{ij})) \\ F'(c_{ij}) &= (f'_1(c_{ij}), \dots, f'_k(c_{ij})) \\ F(g_{ij}) &= F'(c_{ij}) \end{aligned}$$

Theoretically, if  $K = \log n + \log m$ , and  $f_1, \dots, f_k$  has this quality, when  $i_1 \neq i_2$  or  $j_1 \neq j_2$ ,

$$F(g_{i_1 j_1}) \neq F(g_{i_2 j_2})$$

Regardless of which picture element scrambling method is used, the coding key can be decyphered. Therefore, for the point  $g_{ij}$  in  $G$ , there is a point gamma array  $F(g_{ij})$ , and there is one point  $C_{i'j'}$  in  $C$  such that

$$F(g_{ij}) = F(C_{i'j'}).$$

Thus, by varying  $E$ ,  $g_{ij}$  becomes  $C_{i'j'}$ , and  $E$  can thus be determined.

Regarding the encryption method put forward in "A Method of Image Encryption," we have achieved a simpler decyphering method. If  $G$  contains a point  $g_{ij}$  such that

$$F(g_{ij}) = F'(C_{i'j'}),$$

and also when

$$i'' \neq i' \text{ or } j'' \neq j'$$

$$F(g_{ij}) \neq F'(C_{i''j''})$$

it can be concluded that by varying  $E$ ,  $g_{ij}$  becomes  $C_{i'j'}$ .

Since  $r = j - R_i + 1 \pmod{m}$

$$i' = i - R_{Sr} + 1 \pmod{n}$$

$$j' = S_r$$

If we know the points  $C_{i_1 j_1}, \dots, C_{i_m j_m}$  corresponding to the points  $g_{i_1}, \dots, g_{i_m}$  from a line in  $G$ ,

$$r_e = 1 - R_i + 1 \pmod{m}$$

$$i_e = i - R_{SR_e} + 1 \pmod{n}$$

$$j_e = S_{r_e}$$

Then,

$$R_{S_{re}} = i - i_e \pmod{n}$$

$$S_{re} = j_e \quad e = 1, \dots, n$$

Afterwards, by

$$S_{r\alpha} = i$$

$$R_i = i - i_{\alpha} + 1 \pmod{n}$$

we can thus determine the coding key  $\{R_i\}$ ,  $\{S_i\}$ .

We can see from the above discussion that using picture element scrambling methods to encypher an image is entirely different as compared with similar coding systems.

If we adopt the picture element address scrambling method, just by making a change in the coding key method in conveying an image, it will, of course, improve security, but it increases the amount of information conveyed and increases the conveyance time.

If we adopt nonlinear transposition of registers or an FA coding system to produce random arrays to encrypt an image, the amount of information conveyed is not increased, and also very good security results are obtained.

#### REFERENCES

1. Zhang Pingsheng [1728 1456 3932] and Bi Houjie [3968 0624 2638], "A Method of Image Encryption," COMMUNICATIONS NEWS, Vol 5 No 3, March 1984.
2. Yang Zhanqing [2799 1455 7230] and Zhou Tongheng [0719 0681 5899], "Achievements in the FA Coding System," COMPUTER RESEARCH AND DEVELOPMENT, Vol 22 No 3, March 1985.
3. D. Raychaudhuri, "Unauthorized Descrambling of a Random-Line Inversion-Scrambled TV signal," IEEE TRANS. COMMUN., Vol DCM-31 No 6, 1983, pp 816-21.

13226/9365

CSO: 4008/1115

APPLIED SCIENCES

NATION'S LARGEST RADIO TELESCOPE INSTALLED IN SHANGHAI

OW110548 Beijing XINHUA in English 0257 GMT 11 Dec 86

[Text] Shanghai, 11 Dec (XINHUA)--China's largest radio telescope was installed today at the Sheshan observation station of the Shanghai Observatory and will be put into use in the first half of next year.

The radio telescope was developed jointly by the Shanghai Observatory under the Chinese Academy of Sciences and a research institute under the Electronics Industry Ministry.

It is mainly made up of an antenna system which weighs 240 tons and is 25 meters in diameter, a high-sensitivity receiving system which amplifies radio signals and a terminal system which records and handles information.

An official at the Shanghai Observatory said the development of the radio telescope is of great importance to the development of China's technology in surveying very long baseline interference and to the cooperation between Chinese astronomers and their foreign counterparts.

/7358

CSO: 4010/28

APPLIED SCIENCES

TOKAMAK PLASMA RESEARCH FACILITY PASSES TESTS

OW090738 Beijing XINHUA in English 0714 GMT 9 Jan 87

[Text] Beijing, 9 Jan (XINHUA)--A Chinese-developed physics instrument, used in plasma research, has recently passed assessment by the Chinese Academy of Sciences in Hefei, capital of east China's Anhui Province.

Today's PEOPLE'S DAILY reported, "the HT-6m tokamak, developed by the Institute of Plasma Physics under the Chinese Academy of Sciences, is used in measuring the nature and motion patterns of plasma."

Over the past 2 years, a series of experiments have been made on the instrument and valuable experimental data collected, including a paper on pulse surface current experimentation, which was read at an international plasma physics meeting.

Physicists and scholars at the assessment said, "the new device is not only considered advanced in China, but also considered one of the only such instruments in the world which can accurately conduct this type of experiment."

"Work on the instrument began in 1980 and was completed at the end of 1984, and after three months of testing in early 1985, all aspects of the device were operating well," the paper said.

Specialists said, "the instrument's development will help accelerate China's research in nuclear fission-fusion reactors for energy generation," the paper added.

/7358

CSO: 4010/28

## APPLIED SCIENCES

### INSTITUTE OF PHYSICS DISCOVERS SUPERCONDUCTING METAL OXIDE

OW271154 Beijing XINHUA in English 0907 GMT 27 Dec 86

[Text] Beijing, 27 Dec (XINHUA)--Chinese scientists have discovered a superconducting metal-oxide that is claimed to have the highest transition temperature in the world, the Institute of Physics of the Chinese Academy of Sciences announced here today.

This is claimed to be the newest material found in the world to have a transition temperature of 70 on the absolute scale whose zero degree is equivalent to 273 degrees centigrade below zero.

The transition temperature refers to the very low temperature at which an object or metal transforms from the state with electric resistance to the state without resistance. The higher the transition temperature, the greater the value of the superconductor.

According to the scientists at the institute, the world's first superconductor--mercury--was found by a Dutch scientist in 1911 which has a transition temperature of four degrees on the absolute scale and the superconductors mostly applied in industry and research in the world has an absolute transition temperature of 18 degrees and the latest discovery of superconductor has a transition temperature of 37 degrees.

The scientists at the Beijing-based Institute of Physics said that the heterogeneous metal-oxide comprises barium, lanthanum, copper and oxygen and other elements.

The mechanism of the superconductivity of the new material perhaps originates from the influent character of the solid matter, the scientists presumed.

The research of low temperature superconducting materials is one of the new branches of science in the world and scientists of all countries are said to be tackling the problem. The discovery of such new materials is expected to greatly promote the development of high technology.

/8309

CSO: 4010/2006

APPLIED SCIENCES

RIGOROUS MODE METHOD FOR STUDYING DIFFRACTION PROPERTIES OF OPTICAL DISCS

Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 13 No 10, 20 Oct 86 pp 612-617

[English abstract of article by Ruan Yu [7086 3768] and Zhou Zhiping [0719 3112 1627] of the Department of Optical Engineering, Huazhong University of Science and Technology]

[Text] The optical disc and its readout system are analyzed. The rigorous mode method is used to set up a mathematical model of the optical disc diffraction process. The proposed Fortran-77 computing programs using the appropriate numerical techniques can provide rapid, detailed and numerical solutions. The computing results are in good agreement with those of the experiments.

BEAM PROPAGATION CHARACTERISTICS IN RING RESONATORS

Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 13 No 10, 20 Oct 86 pp 623-627, 630

[English abstract of article by Lu Baida [0712 4102 6671], et al., of the Department of Physics, Sichuan University]

[Text] The beam propagation characteristics in the eight-shaped ring resonator containing four mirrors are calculated and compared with those of the standing wave resonator by using three methods: (1) propagation matrix representation; (2) equivalent sequency of thick lenses, and (3) waist position being selected as the reference developing plane. The influence of astigmatism is also discussed.

# ENCODING OF PSEUDOCOLOR EQUIDENSITIES USING COMBINED RONCHI GRATINGS

Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 13 No 10,  
20 Oct 86 pp 643-645

[English abstract of article by Zhou Jin [0719 6651], et al., of the Department of Physics, Nanjing University]

[Text] According to the halftone principle, a screen is introduced which is composed of Ronchi gratings by means of theta modulation. The screen can be used to encode a picture with continuous gray tones. The encoded picture can be demodulated by a spatial filtering system with a polychromatic source. A picture with pseudocolors of equidensity can be gained. The screen can be made easily and developed into multi-density slices.

# CW Ar<sup>+</sup> LASER RECRYSTALLIZATION OF InP FILMS ON SiO<sub>2</sub>

Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 13 No 10,  
20 Oct 86 pp 646-649

[English abstract of article by Lin Chenglu [2651 2052 7627], et al., of Shanghai Institute of Metallurgy, Chinese Academy of Sciences]

[Text] Polycrystalline InP films are deposited on SiO<sub>2</sub> insulating substrate using a conventional RF sputtering equipment. The experimental results show a significant increase in grain size after Ar<sup>+</sup> laser irradiation. Analysis of the stoichiometrical rate of InP by Rutherford backscattering spectrometry shows that the decomposition of InP is greatly suppressed by using a SiO<sub>2</sub> encapsulant. A theoretical discussion of the recrystallization mechanism under Ar<sup>+</sup> laser irradiation is presented.



FORMING RING PROFILE LASER BEAM AND ITS APPLICATIONS

Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 13 No 10,  
20 Oct 86 pp 654-657

[English abstract of article by He Hailin [0149 3185 2651] of Shanghai  
Medical Equipment Research Institute]

[Text] This paper reports a new and useful optical component--a cylinder  
converter with two convex circular cones. It can convert the circular  
profile of a laser beam into a ring of given sizes. The principle, structure  
and choice of parameters are described. Some applications of laser beams  
with ring profiles are given.

9717

CSO: 4009/10

## APPLIED SCIENCES

### DYNAMIC BEHAVIOR OF SYSTEM WITH DELAYED FEEDBACK

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1115-1125

[English abstract of article by Zhao Yong [6392 0516], et al., of the  
Institute of Plasma Physics, Chinese Academy of Sciences, Hefei]

[Text] In this paper, the necessary and sufficient conditions of a system with delayed feedback have been derived. In order to study the bifurcation and chaotic behavior, an asymptotic expansion of the solution in terms of inverse delay time ( $T_R^{-1}$ ) has been obtained. In long delay time limit, the first order effect in  $T_R^{-1}$  is to prolong the period of the motion. More interesting phenomena are found in the higher order terms. The  $T_R^{-2}$  terms lead to some hysteresis processes (some bistability) at each bifurcation point. The third approximation in  $T_R^{-1}$  influences the period-doubling bifurcation, i.e., the ratio of the periods below and at the transition point is not exactly two. It is also shown that some unstable windows appear at the merging points of the chaotic bands and lead to some mode-locked phenomena.

### STABLE REGION OF TOKAMAK DEVICE FEEDBACK CONTROL (II). EXPERIMENTAL

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1126-1133

[English abstract of article by Shen Zhongqing [3088 0112 0615], Zheng Shaobai [6774 1421 1401] and Wang Long [3769 7893] of the Institute of Physics, Chinese Academy of Sciences]

[Text] A stable region experiment of feedback control in the CT-6B Tokamak has been conducted. Two feedback systems have been used simultaneously to control the heating field and vertical magnetic field in the Tokamak. The experimental results are compared with the linear theory described in part (I) of this paper. The authors find that the experimental stable regions are somewhat smaller than predicted by linear feedback theory.

## EXPERIMENTAL STUDIES OF $F_3^+$ COLOR CENTERS IN LiF CRYSTAL

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1148-1157

[English abstract of article by Zheng Lixing [6774 4539 5887], et al., of the Department of Physics, Tianjin University]

[Text] In this paper, the authors describe systematically some experimental results of the optical characteristics of the creation of  $F_3^+$  centers in LiF crystal by electron bombardment under different conditions. The relative density between  $F_3^+$  and  $F_2$  centers is analyzed from fluorescence spectra. The experimental results show that the irradiation temperature plays an important role in the creation of the  $F_3^+$  and  $F_2$  centers and affects the relative density of the  $F_3^+$  and  $F_2$  centers. The main results are as follows: (1) Irradiation at the liquid nitrogen temperature, followed by warming to room temperature in the dark, can create  $F_3^+$  centers of high density, which can be seen from the fluorescence spectra as the fluorescence of the  $F_3^+$  centers centered at 530 nm is much stronger than that of the  $F_2$  center (670 nm), and fewer N centers and R centers are present in the absorption spectra. (2) From dynamic fluorescence spectra it can be shown that, in the samples irradiated at liquid nitrogen temperature, the density of the  $F_3^+$  centers increases rapidly when the  $F_2^+$  centers decay. However, in the samples irradiated at room temperature, the growth of the  $F_3^+$  and  $F_2$  centers is at approximately the same rate. (3) The authors observed the band width and double pike structure of the fluorescence excitation spectra of the  $F_3^+$  and  $F_2$  centers.

## ON THE ABERRATION THEORY FOR WIDE AND NARROW ELECTRON BEAMS IN COMBINED ELECTROMAGNETIC FOCUSING SPHERICAL CATHODE LENS SYSTEM

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1199-1209

[English abstract of article by Ai Kecong [5337 0344 5115] of Xi'an Research Institute of Applied Optics; Zhou Liwei [0719 4539 0251] of Beijing Institute of Technology; Ximen Jiye [6007 7024 4764 2814] of Beijing University]

[Text] In the present study, an aberration theory for both wide and narrow electron beams in a combined electromagnetic focusing spherical cathode lens system is discussed. The general formulae of aberration coefficients for first and third order transversal geometrical and chromatic aberrations on any ideal image plane have been derived under the following conditions: when the objective and image fields have finite curvatures and when the cathode is immersed in magnetic and transversal electric fields.

Based on the variational analysis method and the trajectory calculation method, the relationship between the wide electron beam system and the narrow electron beam system is considered in detail. It is shown that these two different electron beam systems can be treated equally and their aberration equations and coefficients can be expressed in a universal form, if one considers the definite energy and angular initial distributions and utilizes the first order linear trajectory equation. In the present paper, electron trajectories are described in the vector form. The aberrations are expressed in the matrix form and are thus appropriate for computer calculations.

RELATIVISTIC ABERRATION THEORY FOR COMBINED ELECTROMAGNETIC FOCUSING-  
DEFLECTION SYSTEM POSSESSING SPHERICAL CATHODE LENS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1210-1222

[English abstract of article by Ai Kecong [5337 0344 5115] of Xi'an Research  
Institute of Applied Optics; Ximen Jiye [6007 7024 4764 2814] of Beijing  
University; Zhou Liwei [0719 4539 0251] of Beijing Institute of Technology]

[Text] In the present paper by means of the variational principle, the relativistic aberration theory for a combined electromagnetic focusing-deflection system possessing a spherical cathode lens is studied. The authors discuss the following general cases: electrons emitted from the cathode possess definite energy and angular initial distributions; the objective and image fields have finite curvatures; the cathode is situated in both magnetic and transversal electric fields. For these general cases, the general formulae of aberration coefficients for first and third order transversal geometric and chromatic aberrations on any ideal image plane are given in explicit form. The above-mentioned aberration coefficient formulae can be applied to the following cases: either the wide electron beam system or the narrow electron beam system; either relativistic or non-relativistic electron optical system; either the cathode or the screen having a spherical or planar shape. In addition, the electron trajectories are described in the complex form. The aberrations are expressed in the matrix form, and are thus suitable for computer computations.

MEASUREMENT OF SOME LEVEL WIDTHS IN  $^{40}\text{Ca}$  BETWEEN 9.5 AND 10.5 MEV

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1182-1191

[English abstract of article by Gu Mu [7357 3665], et al., of the Department  
of Nuclear Science, Fudan University, Shanghai]

[Text] The total widths of two excited states at 9603.9 keV and 10321.0 keV, and of a doublet at 9864.6 and 9868.8 keV in  $^{40}\text{Ca}$  have been measured with resonance  $\gamma$ -ray absorption. The gamma radiations from  $^{39}\text{K}$  (p, $\gamma$ ) reaction at  $E_p = 1307.2$  keV, 2042.8 keV and 1595.0 keV have been selected to excite the corresponding levels in  $^{40}\text{Ca}$ . Accurate results for the widths of 9603.9 keV and 10321.0 keV states are obtained for the first time. They are  $188 \pm 47$  eV and  $91 \pm 15$  eV, respectively. For the 9864.6 and 9868.8 keV states, they are  $100 \pm 24$  eV and  $899 \pm 214$  eV. Because the 9864.6 and 9868.8 keV states are a close-lying doublet, the resonance  $\gamma$ -ray absorption technique was used in a special way: two groups of gamma rays were used to excite the same two levels, so that cross excitation occurred. The authors extended the corresponding experimental analysis. In addition, (p,  $\gamma$ ) yield measurements have been made to extract the level widths of the 9603.9 keV and 10321.0 keV states. The results are in agreement with the values deduced from resonance  $\gamma$ -ray absorption. The (p,  $\gamma$ ) resonance strengths and isospins of the 9603.9 keV and 10321.0 keV states in  $^{40}\text{Ca}$  are also discussed.

## EFFECT OF FLOWING PLASMA IN TOKAMAK ON TEARING MODES

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1227-1232

[English abstract of article by Wang Maoquan [3076 5399 3123] of the Institute of Plasma Physics, Chinese Academy of Sciences, Hefei]

[Text] In this article, the activities of tearing modes are analyzed when the plasma in Tokamak has a flowing velocity. The analysis and numerical calculation indicate that the total flowing of the plasma (equivalent to a plasma with a rotational frequency) does not influence the activities of the tearing modes, but causes the rotation of the magnetic island with a frequency equal to the rotational frequency of the plasma. The applied helical magnetic field can suppress the rotation of the plasma effectively in the tearing layer. The role of stabilization of the helical magnetic field on the tearing modes is not affected by the plasma rotation.

## SUPPRESSING THE TEARING MODES IN TOKAMAK BY ELECTRON CYCLOTRON RESONANCE HEATING

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1233-1237

[English abstract of article by Wang Maoquan [3076 5399 3123], et al., of the Institute of Plasma Physics, Chinese Academy of Sciences, Hefei]

[Text] Using the localization of electron cyclotron resonance heating, the profile of the plasma current is improved so that the stability conditions of the tearing modes are also improved. As long as the absorbed region of the electron cyclotron resonance heating covers the resonance layer of the tearing modes, the effects of stabilization are very good. It is not necessary to require that the electron cyclotron resonance surface coincide strictly with that of the tearing mode. During the electron cyclotron heating, the tearing mode is suppressed effectively.

INTERFACE EFFECT BETWEEN DIFFERENT PHASES IN PROCESS OF PHASE SEPARATION AND  
CRYSTALLIZATION OF AMORPHOUS  $\text{Li}^+$  CONDUCTOR

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 9, Sep 86  
pp 1238-1242

[English abstract of article by Yu Wenhai [0205 2429 3189], et al., of the  
Department of Physics, University of Science and Technology of China, Hefei]

[Text] The authors found that, in the isothermal treatment process of the  
amorphous  $\text{Li}^+$  conductor  $\text{B}_2\text{O}_3\text{-}0.7\text{Li}_2\text{O-}0.7\text{LiCl-}0.1\text{Al}_2\text{O}_3$ , the plot of the con-  
ductivity versus time rises at first and then, after passing a maximum, falls  
monotonically, followed by two flat sections. It has been established that  
these phenomena are due to the phase separation and crystallization of this  
amorphous material. In this work, the authors develop a viewpoint of the  
interface effect between the different phases, i.e., it is considered that  
there is a high conductivity layer at the interface between different phases  
and its contribution compensates for or exceeds the decreasing conductivity  
caused by the bulk effect, of the crystallization. Based on this interface  
effect, an explanation for the above-mentioned experimental plot is given.

9717

CSO: 4009/12

SUPPRESSOR CELL FUNCTION, THYMOPEPTIDE THERAPY IN VIRAL HEPATITIS B

Beijing CHINESE MEDICAL JOURNAL in English Vol 99 No 10, Oct 86 pp 791-798

[Article by Zhang Dingfeng [1728 1353 7364], Chen Guomin [7115 0948 3046], Fan Chun [5400 3196], and Mi Zhengdong [4717 4394 2767], Institute of Viral Hepatitis, Chongqing Medical University, Chongqing]

[Text] Suppressor cell function, soluble immune suppressor supernatant (SISS-T) and serum anti-LSP were measured in 140 cases of viral hepatitis B. A significantly reduced suppressor cell activity (SCA) and SISS-T were observed in fulminant or subacute liver failure and chronic active hepatitis (CAH). The positivity rate of anti-LSP in patients with SCA below 40% was higher than in those with SCA above 40% ( $P < 0.005$ ). The low SCA was associated with abnormalities of serum GPT and serum bilirubin. Thymopeptide together with conventional therapy was used to treat 25 cases of subacute liver failure. 12 cases survived. Of 24 cases of CAH treated with thymopeptide, 22 cases showed a temporary return of SGPT to normal. Most of the cases that improved after thymopeptide therapy demonstrated markedly increased SCA, decreased anti-LSP, and normal liver function tests ( $P < 0.005$ ), suggesting possible association of reduced SCA with pathogenesis of viral hepatitis B. Since thymopeptide contains polypeptides which can simultaneously influence the activity of helper and suppressor cell, in vitro determination of SCA and selection of optimal thymopeptide concentration may be helpful to clinical treatment.

HBV virus is not necessarily directly cytopathogenic, and the diversity of pathological changes found in viral hepatitis B has been found to be attributed to the variation of the host's immune response capability to eliminate or suppress the infective agent<sup>1</sup>. Current evidence suggests that abnormal immunoregulatory lymphocytes may permit an autoaggressive cellular immune response to the hepatocyte membrane antigens, resulting in liver cell damage<sup>2</sup>. However, whether malregulation explains the entire process of the pathogenesis of viral hepatitis B is debatable. That different suppressor cells belong to different subpopulations in human

peripheral blood has been described in recent years. These suppressor cells can be differentiated not only by their surface markers but also by their specific effector functions. The contradictory results reported by different authors are due to difference in in vitro suppressor cell assay methods used by these authors<sup>3-5</sup>.

Thymosin has been shown to exert specific effects on regulatory T cell function<sup>6</sup>. Some investigators have observed that thymosin fraction 5 could promote in vitro restoration of suppressor T cell function in patients with CAH.<sup>7,8</sup>

The present study attempts to clarify the role of SCA in immunoregulation of various types of viral hepatitis B infection by means of functional assays, namely Con A-induced suppressor cell function, SISS-T and anti-LSP. In addition, it is designed to evaluate the effect of thymopeptide (a calf thymic extract) on in vitro and in vivo human SCA in order to assess the correlation between clinical improvement of symptoms and the concomitant changes of SCA and anti-LSP titers in viral hepatitis B.

#### METHODS

**Patients.** This study consisted of 140 cases of various types of viral hepatitis, including 21 cases of acute viral hepatitis (AVH-B), 8 of non-B acute viral hepatitis, 35 of fulminant or subacute liver failure (2 fulminant and 33 subacute liver failure), 43 of HBsAg-positive chronic persistent hepatitis (CPH-B) and 12 asymptomatic HBsAg carriers. 21 healthy subjects with no history of liver diseases were also studied as controls. Percutaneous needle biopsies of the liver were obtained from 31 cases of fulminant or subacute liver failure, 35 cases of CAH-B, 10

cases of CPH-B and 1 case of AVH-B. Pathological examination was performed using HE stain, histochemical stain and ABC stain for HBsAg. The ultrastructure was determined by electromicroscopy. Pathological diagnosis was made according to the international criteria<sup>9</sup>.

Sera were obtained biweekly for determination of HBsAg by RPHA, anti-HBs by PHA, anti-HBc by ELISA, DNA polymerase by the modified Kaplan's method and HBeAg by ELISA. Liver function tests were performed weekly, including glutamic-pyruvic transaminase (GPT), direct and indirect bilirubin, albumin-globulin ratio, zinc sulfate turbidity and prothrombin time.

Thymopeptide (supplied by the Changchun Institute of Biological Products), together with conventional therapy, was used to treat 24 cases of CAH-B at a dose of 6 mg/day i.v for three months and 25 cases of subacute liver failure at a dose of 12 to 20 mg/day i.v. for 2 or 3 months. 17 cases of CAH-B were treated with traditional Chinese medicine as control. SCA and liver function tests were performed at two-week intervals.

**Con A-induced SCA.** This system is the modified method of Shou et al<sup>10</sup>. PBM ( $2 \times 10^6$ /ml) in medium RPMI 1640 containing 5% fetal serum was incubated in glass tubes with (suppressor cells) and without (control cells) Con A (10  $\mu$ g/ml, Sigma Chemical Co.) at 37 C for 48 hours. At the end of this preliminary culture, the control and Con A induced suppressor cells were washed once with Hank's solution, treated with 50  $\mu$ g/ml mitomycin C (Kyoma Kakko Kogyo Co.) for 30 minutes, washed again twice and finally resuspended in RPMI/FCS media. One hundred thousand responder cells plus  $1 \times 10^5$  control cells of Con A-induced suppressor cells were placed in triplicate in the wells of the microtitre plate with Con-A, 10  $\mu$ g/ml in 200  $\mu$ l media. One series of responder cells and suppressor cells incubated without Con A served as controls. The cells were incubated for 3 days in an atmosphere of 5% CO<sub>2</sub> at 37C. Cells were harvested by multiple channel automatic harvester (Skatronas Lier, Norway) after a 6-hour pulse with tritiated thymidine (1  $\mu$ Ci/well). The percentage of suppression was calculated using the formula:

$$\text{Suppression rate} = \left(1 - \frac{\text{CPM (Suppressor cells+responder cells)}}{\text{CPM (Control cells+responder cells)}}\right) \times 100\%.$$

**Elaboration of SISS-T by Con A.** SISS-T assay was carried out simultaneously with the suppressor cell function assay by a reproducible method developed by Greene et al<sup>11</sup>. PBM suspended in  $2 \times 10^6$  cells/ml diluent containing 10% FCS was incubated with Con A (10  $\mu$ g/ml) at 37 C for 48 hours in a humidified atmosphere containing 5% CO<sub>2</sub>. At the end of the culture, the supernatant was recovered. Absorption of the supernatant with 10% sterile hydrated Sephadex G 50 (30 minutes at 37C) was carried

out to remove the residual Con A, and then the supernatant was centrifuged at 1,500 rpm for 5 minutes. The supernatant was stored at -20 C for SISS-T.

The responder cells ( $1 \times 10^5$  cells/ml) plus 200  $\mu$ l of SISS-T or supernatant prepared without Con A were placed in triplicate in the microtitre plate wells. The suppression rate was determined as previously described and calculated using the following formula:

$$\text{Suppression rate} = \left(1 - \frac{\text{CPM (SISS-T+responder cells)}}{\text{CPM (Control supernatant+responder cells)}}\right) \times 100\%.$$

**Promotion of SCA by thymopeptide.** In the initial culture of suppressor cells, 0,100,400 and 800  $\mu$ g/ml of thymopeptide were added into the PBM suspension ( $2 \times 10^6$ ) and incubated with Con A (10  $\mu$ g/ml) for 48 hours. The procedures

following this were identical to those of the Con A-induced suppressor cell function assay. The effect of thymopeptide on suppressor cell function was determined using the formula:

$$\text{Suppression rate} = \left(1 - \frac{\text{CPM (Thymopeptide pretreated suppressor cells + responder cells)}}{\text{CPM (Control cells+responder cells)}}\right) \times 100\%$$



**Enzyme-linked immunoassay for anti-LSP.** This assay was performed according to the method described by Hao et al<sup>12</sup>. The plastic discs were exposed to the purified LSP dissolved at a concentration of 100 µg/ml in carbonate buffer solution (pH 9.6) at 37 C for 2 hours, and then at 4 C overnight. The coated discs were washed three times with Tris-Tween 20 solution (pH 7.4). 0.1 ml of serum sample diluted with PBS-Tween 20 buffer (pH 7.4) in serial dilutions of 1:40, 1:80 and 1:160 was placed in the coated discs and incubated at 37 C for 1.5 hours. The discs were washed 3 times with Tris-Tween 20 solution (pH 7.4) and incubated with 0.1 ml of peroxidase-conjugated staphylococcus protein A at 37 C for 1.5 hours. The discs were washed and incubated again with 0.1 ml of diaminobenzidine and H<sub>2</sub>O<sub>2</sub>. The reaction was terminated with 0.1 ml of 2 M sulphuric acid and the result was read at 492 nm wavelength using a ELISA test photometer. A normal serum pool served as control and a value of P/N above 2 was considered positive.

Statistical comparison between groups was made using the Student t test. Correlation between SCA and SISS-T was assessed using linear correlation analysis. Correlation between SCA and anti-LSP and liver function was determined using Chi-square test.

## RESULTS

**Suppressor cell function.** Con-A induced SCA was determined in 140 cases of various types of viral hepatitis B infection. At the same time SISS-T and anti-LSP were measured. The correlation of the results of these three assays was tested.

SCA in healthy subjects was 64.4±13.6% (Table 1). A significantly reduced SCA was observed in fulminant and subacute liver failure (19.7±17.1,  $p<0.001$ ) and CAH (41.2±21.3,  $p<0.002$ ), while moderately and temporarily reduced SCA was found in AVH-B (41.2±22.9,  $p<0.005$ ). By contrast, SCA was within the normal range in asymptomatic carriers, acute non-B hepatitis and CPH.

The normal range of SCA, as determined in healthy subjects, was 37–91.6% ( $M\pm 2SD$ ). SCA defect was demonstrated in 30 (85.7%) of 35 fulminant and subacute liver failure cases, 24 (55.8%) of 43 of CAH, 10 (47.6%) of 21 AVH-B and 4 (20.0%) of 20 CPH. All 12 asymptomatic carriers showed normal SCA. Therefore a rela-

Table 1. SCA in various types of viral hepatitis B

Patients	No.	SCA	M ± SD
Normal donors	10	64.4	16.4
Asympt. carriers	12	69.3	12.7
FHF & SHF	35	19.7	17.7*
CAH	47	41.2	21.3**
AVH-B	21	41.2	22.9***
AVH-Non B	8	59.8	21.2
CPH	20	52.0	21.3

\*  $p<0.01$ , \*\*  $p<0.02$ , \*\*\*  $p<0.05$ .

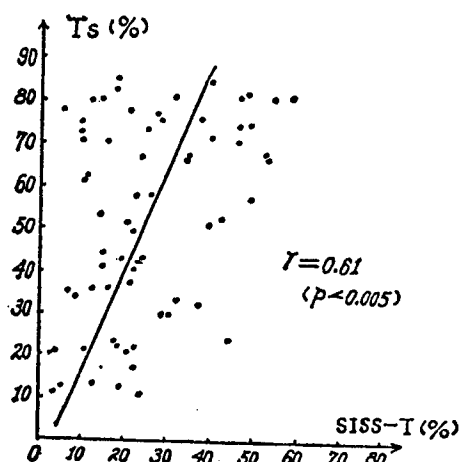


Fig 1. Correlation between SISS-T and SCA

tionship between disturbances of SCA and hepatocellular injury in various type viral hepatitis B infection is suggested. Figure 1 shows that SISS-T activity varied with the SCA (coefficient of correlation is 0.61,  $p<0.005$ ). A significant defect in SISS-T was similarly found in fulminant and subacute liver failure and CAH, and thus SISS-T might be used as an immunomodulator in the treatment of viral hepatitis instead of suppressor cells per se. This needs further research.

Anti-LSP was present in most cases of fulminant and subacute liver failure (86%  $p<0.005$ ) and CAH patients (71%,  $p<0.005$ ). The incidence of anti-LSP was higher in patients whose SCA was below 40% than in those whose SCA was above 40% (Table 2,  $p<0.005$ ).

Table 2. Relations between SCA and anti-LSP

SCA	No.	anti-LSP positive	%
< 40%	52	41	79
> 41%	71	30	42

$$X^2 = 16.51 \quad p < 0.005$$

Diminished SCA in patients with various types of viral hepatitis B infections was found to be associated with abnormalities of serum GPT and serum bilirubin (Table 3). A marked decrease of SCA in fulminant and subacute liver failure may indicate a poor prognosis. Of the 9 cases with SCA above 25%, 8 recovered, while of

the 11 cases with a value below 25%, only one did.

**Therapeutic effects of thymo peptide in CAH and fulminant and subacute liver failure.** The elevated serum GPT returned normal in 22 of 24 (92%) CAH cases after thymo peptide therapy (Table 4), whereas in the control group, only 7 of 17 cases did. Abnormal serum bilirubin returned normal in all 12 cases of CAH after thymo peptide therapy. In the control group of 9 cases, 3 did so. Of 25 cases of subacute liver failure treated with thymo peptide together with conventional therapy 12 survived. In contrast, only 5 of the 46 cases treated with conventional therapy survived.

**Thymo peptide effects on in vitro and in vivo**

Table 3. Relations between suppressor cell activity and liver functions

	No.	SGPT 100u (%)	Bilirubin 1.2mg/ml (%)	ZnTT 15u (%)
Patients with SCA 40%	27	24 (88.9%)	19 (70.4%)	9 (33.3%)
Patients with SCA 41%	24	8 (33.3%)	7 (29.2%)	9 (37.5%)
		$X^2 = 16.78, \quad p < 0.005$	$X^2 = 8.63, \quad p < 0.005$	N.S.

Table 4. Comparison of therapeutic effects of thymo peptide in CAH

	SGPT		Serum bilirubin	
	elevated	normal (%)	elevated	normal (%)
Thymo peptide	24	22 (92%)	12	12 (100%)
Control	17	7 (41.1%)	9	3 (33.3%)
		$X^2 = 12.2, \quad p < 0.005$	$X^2 = 11.2, \quad p < 0.005$	

**suppressor cell activity.** In the 2-day initial cultures SCA markedly increased in the thymo peptide pretreated group as compared to that in the untreated cultures (Fig 2). The optimal dose inducing maximal enhancement of SCA was 400 µg/ml in subacute liver failure cases, whereas it was only 200 µg/ml in CAH cases, suggesting that the individual optimal dose varied portionally with Con A- induced SCA without thymo peptide pretreatment. A dose beyond the optimal limit always caused a significant decrement of SCA, this was possibly due to enhancement of helper cell activity rather than SCA.

Different individual optimal doses were

found for different type viral hepatitis patients (Table 5). There was no correlation between the individual optimal dose and the abnormal liver functions. In all the cases in which thymo peptide was ineffective, the in vitro optimal doses were 400 µg/ml or more. In these cases, no matter how big the doses used clinically, no satisfactory effect was achieved.

In CAH patients in whom thymo peptide therapy was effective, SCA varied inversely with the serum GPT during therapy (Fig 3). In subacute liver failure patients, SCA varied inversely with the serum bilirubin (Fig 4).

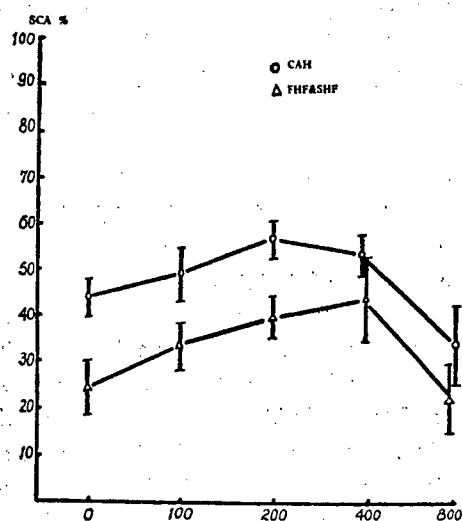


Fig 2. In vitro effect of different thymopeptide concentrations on SCA in fulminant and subacute liver failure and CAH

Table 5. In vitro stimulation of SCA by thymopeptide

	Thymopeptide (µg/ml)			
	100	200	400	800
CAH	3	7	5	0
Fulminant & subacute liver failure	2	3	11	1

After thymopeptide therapy, most of the cases in which this therapy was effective showed a marked increase in SCA accompanied by a decline of anti-LSP and normalization of the abnormal liver functions (Table 6). The SCA in all cases in which thymopeptide was ineffective remained unchanged or decreased, accompanied by persistent or increased anti-LSP. It suggests that SCA, the anti-LSP and abnormal liver functions may be interrelated.

#### DISCUSSION

In this study, we observed a very high incidence of suppressor cell dysfunction in CAH and fulminant and subacute liver failure induced by hepatitis B virus. Though in some patients no correlation was observed between SCA and changes of serum GPT and bilirubin, variation of

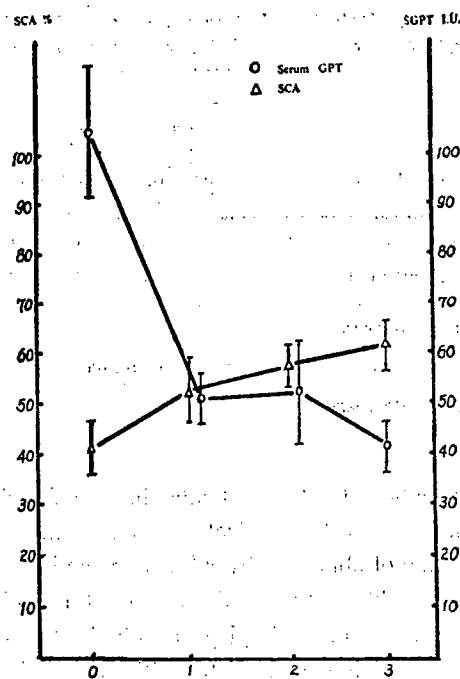


Fig 3. Relations between SCA and serum GPT in CAH

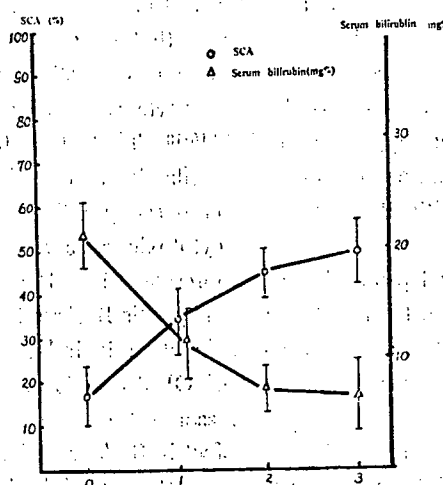


Fig 4. Relations between SCA and serum bilirubin in fulminant & subacute liver failure patients.

SCA in various type viral hepatitis B infections as a group was associated with concomitant changes of liver functions and anti-LSP. It is very interesting to note that SCA in the

**Table 6. Relations between changes of SCA, anti-LDP and clinical improvement after treatment**

Clinical features	No	Changes of SCA			
		↑	↔	↓	↔
		Changes of anti-LSP titer			
		↓	↔	↑	↔
Improvement	22	13	3	1	5
No improvement	8	2	1	4	1

$\chi^2 = 8.97, p < 0.05$

↑ Means increase, ↔ Means no change,

↓ Means decrease.

thymopeptide treated patients improved with amelioration of the clinical symptoms and normalization of abnormal liver functions and serum anti-LSP. Thus our findings support the idea that a defect in SCA plays a role in the pathogenesis of human viral hepatitis B infections. This is in agreement with the observations of several authors<sup>13-15</sup> that patients with CAH of different etiologies had a reduced ability to suppress several T and B cell functions in vitro. Recently, it has been found that no correlation exists between the suppressor cell functions and the proportion of T lymphocyte subsets or the helper/suppressor ratio.<sup>13,16-18</sup> That the total population of OKT 8 cells is increased in hepatitis B virus infection possibly reflects the augmented numbers of cytotoxic cells and decreased proportion of suppressor cells. It might explain the fact that after hepatitis B virus infection the suppressor cell function is indeed decreased despite increase of OKT 8 cells and reduction of helper/suppressor ratio. Moreover we also found that the defect in SCA was always associated with the presence of serum inhibitory factor which inhibited the suppressor cell function of normal donors, suggesting that the reduced suppressor cell function could be attributed to the serum inhibitory factor produced by the damaged liver. Nouri-Aria et al<sup>19</sup> observed that *in vitro* incubation of lymphocytes from patients with active autoimmune CAH with

prednisolone could correct the defect with no alteration in the proportion of T suppressor lymphocytes. We are inclined to believe that the apparently contradictory findings in the suppressor cell function and the subset population assays could be partly because of the activity of serum inhibitory factor that inhibits suppressor cell function but does not influence the surface marker of OKT 8 lymphocytes. Hence the use of monoclonal antibodies to determine the helper/suppressor ratio as an index of immunoregulation in patients having an increased number of cytotoxic T cells could be potentially misleading. An accurate estimate of immune regulation can only be obtained by functional assays, even though the Con A-induced suppressor cell activity test, for example, is non-specific. Additional studies on suppressor cell function specific for the HBV antigens in hepatitis B virus infection may lead to a better comprehension of the immunoregulatory mechanisms involved in this disease.

Marked restoration of the suppressor cell activity and significant improvement of clinical symptoms were observed in patients receiving thymopeptide, as reflected by normalization of serum transaminase levels, decrease of anti-LSP, etc. There were no significant changes in serum HBV markers, including the serum HBsAg titer, HBeAg, and DNA polymerase.

Since thymopeptide contains polypeptides which can simultaneously influence both helper and suppressor cell activities, its therapeutic effect may be influenced by the pretreatment situation of suppressor cells, the dose and mode of administration of this thymic hormone as well as the duration of treatment. Serum inhibitory factor may possibly impede the maturation of presuppressor cells that would otherwise be differentiated into suppressor cells in the presence of thymopeptide and subsequently induced by Con A into activated cells. In patients with severe viral hepatitis, high titers of serum inhibitory factor could possibly exert a cytotoxic effect on the suppressor cells and make them

undergo irreversible changes. In this situation, thymopeptide may augment the helper cell function rather than the suppressor cell function, resulting in enhancement of cytotoxicity and clinical deterioration of the disease. Hence in vitro determination of SCA and optimal thymopeptide concentration might be helpful to the clinical treatment. Dabrowski et al<sup>20</sup> have utilized biologically active thymus derived factors to treat patients with chronic hepatitis B virus infection and observed in vivo improvement of T cell counts and clinical symptoms. Nevertheless, Hegarty et al<sup>21</sup> have found that in patients with inactive 'autoimmune' CAH treated with corticosteroid and azathioprine at maintenance doses, thymic hormone had no effect on the clinical course or the suppressor cell defect during the treatment withdrawal period. Relapse of the disease was seen as often in the treated as in the untreated groups and was invariably accompanied by SCA defect. Whether the ineffectiveness of thymic hormone in the treatment of 'autoimmune' CAH is due to the different etiologies, or because the duration of treatment is not long enough to allow maturation of immunocompetent suppressor T cells is unclear.

#### REFERENCES

1. Edgington TS, Chisari FV. Immune response to hepatitis B virus coded and induced antigens in chronic active hepatitis. In Eddleston ALWF, et al (eds): Immune reactions in liver diseases. First edition. London: Pitman Medical Publishing Co Ltd, 1979; 44-60.
2. Wands JR, Hodgson HJF. Alteration in suppressor cell activity in patients with chronic active hepatitis. *ibid.* pp 118-119.
3. Chisari FV, et al. Functional properties of lymphocyte subpopulation in hepatitis B virus infection. I. Suppressor cell control of T lymphocyte responsiveness. *J Immunol* 1981; 126:38-44.
4. De Galocsy C, et al. Increased sensitivity to Concanavalin A and a suppressor cell defect in chronic active hepatitis. *Clin Exp Immunol* 1981; 43:486-490.
5. Kashio T, et al. Lymphocyte suppressor cell activity in acute and chronic liver disease. *Clin Exp Immunol* 1981; 44:459-466.
6. Incefy GS. Effects of thymic hormones on human lymphocytes. *Clin Immunol Allergy* 1983; 3: 95-117.
7. Mutchnick MG, et al. Increased thymic hormone response suppressor T lymphocyte function in chronic active hepatitis. *Dig Dis Sci* 1983; 28:328-334.
8. Neuenschander JR, et al. Thymosin induction of short lived suppressor cell activity in chronic active hepatitis (abstract). *Gastroenterology* 1981; 80:1362.
9. Fogarty International Center Proceeding No. 22. Nomenclature, diagnostic criteria and diagnostic methodology for disease of the liver and biliary tract. Washington D.C.: US Govt. Printing Office, 1976.
10. Shou L, et al. Suppressor cell activity after Concanavalin A treatment of lymphocytes from normal donors. *J Exp Med* 1976; 143:1100-1110.
11. Greene WC, et al. Soluble suppressor supernatants elaborated by Concanavalin A activated human mononuclear cells. I. Characterization. *J Immunol* 1981; 126:1185-1191.
12. Hao LJ, et al. Detection of anti-LSP by SPA-ELISA in sera of hepatitis patients. *Chin J Intern Med* 1983; 22:502-504.
13. Coovadia HM, et al. Suppressor cells assayed by three different methods in patients with chronic active hepatitis and systemic lupus erythematosus. *Clin Immunol Immunopathol* 1980; 18:268-275.
14. Kakumu S, et al. Immunoregulatory T-cell functions in acute and chronic liver disease. *Gastroenterology* 1980; 79:613-619.
15. Tremolada F, et al. Suppressor cell activity in viral and non-viral chronic active hepatitis. *Clin Exp Immunol* 1980; 40:89-95.
16. Hegarty JE, et al. Contrasting relationship between suppressor T cell numbers and function in immune mediated chronic liver disease. *Act Med Rom* 1983; 21:511-521.
17. Barnaba V, et al. Relationship between T cell subsets and suppressor cell activity in chronic

hepatitis B virus infection. Clin Exp Immunol 1983; 53:281-288.

18. Lemm G, et al. Studies on immunoregulatory mechanisms in acute and chronic hepatitis B. Clin Exp Immunol 1983; 52:250-258.

19. Nouri-Aria KT, et al. Effect of corticosteroids on suppressor cell activity in autoimmune and viral chronic active hepatitis. N Engl J Med 1982; 307:1310.

20. Dabrowski MP, et al. Immunotherapy of patients with chronic virus B hepatitis. I. Maturation of human T-lymphocytes under influence of calf thymic hormone. Clin Immunol Immunopathol 1980; 16:297-307.

21. Hegarty JE, et al. Controlled trial of a thymic hormone extract in 'autoimmune' chronic active hepatitis. Gut 1984; 25:279-283.

/9365

CSO: 4010/1018

## LIFE SCIENCES

### BRIEFS

ZHEJIANG FETUS ELECTROCARDIOGRAPHS--Hangzhou, 18 Nov (XINHUA)--Scientists at a provincial research institute say they have developed a new electrocardiograph, designed to detect the heart beat of a fetus, that is much better than the imported type. The developers say the new instrument shows only the electrocardiogram of the fetus, thus ensuring more accurate diagnosis. The old machines showed the heart beat of both fetus and the mother. According to the experts experiments in hospitals show the average success rate of the new instrument to be 76 percent and during the last month of the pregnancy the accuracy rate can be as high as 91.5 percent. The new instrument was invented by the Provincial Computation Research Institute and two hospitals here in the city of Zhejiang Province in east China. [Text] [Beijing XINHUA in English 0646 GMT 18 Nov 86 OW] /6662

MEDITERRANEAN ANEMIA GENES IDENTIFIED--Chongqing, 30 Dec (XINHUA)--Chinese doctors have identified in Sichuan Province five kinds of mutated genes of Mediterranean Anemia, a rare hereditary disease that has no effective cure yet in the world. The new discoveries have brought the total number of such genes found in the world to more than 30 and provided further basis for prenatal diagnosis. Patients with such disease usually have swollen kidney and spleens and could only live by receiving blood transfusions. The only method of preventing such disease is to make prenatal diagnosis and if diseases genes are found, to terminate the pregnancy. The five kinds of mutated genes were identified by doctors at the Hereditary Disease Research Office of the Changhai Children's Hospital and the Chongqing People's Hospital No 2 by applying a newly-developed technology called oligonucleotide which determines the structure of human body cells and the order of protein genes. The abnormality of gene order in human body cells leads to hereditary disease, explained local doctors. [Text] [Beijing XINHUA in English 0240 GMT 30 Dec 86 OW] /6662

CSO: 4010/1020

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### PROMINENT AEROSPACE PERSONALITIES INTRODUCED

Beijing HANGTIAN [SPACEFLIGHT] in Chinese No 5, 26 Sep 86 pp 9-11

[Article reprinted from LIAOWANG [OUTLOOK] overseas edition No 15, (1986); material obtained from the GREAT CHINESE ENCYCLOPEDIA, Volume "Aeronautics and Astronautics:" "The Twelve Chinese Members of the International Academy of Astronautics"]

[Text] At the meeting of the International Academy of Astronautics held in Stockholm, October 1985, to celebrate its 25th anniversary, the first 12 spaceflight specialists nominated by China had the honor of being elected members of the academy and received membership certificates and academy statutes.

Founded in 1960, the International Academy of Astronautics (IAA), is a highly-reputable international astronautics organization operating on a system of elected academicians as members. There are presently 699 academicians of three categories: honorary academicians, regular academicians, and corresponding academicians. Only persons of outstanding achievements in the field of spaceflight S&T are qualified to be elected academicians.

On this day of great rejoicing, the 30th anniversary of China's initiation of its own spaceflight endeavors, this periodical will give simple resumes to introduce the said 12 members (in stroke order of the Chinese characters of their surnames), and express on behalf of our large reader audience our highest esteem and respect to these 12 Chinese members and to the thousands of tens of thousands of nameless heroes who have developed and made important contributions to China's spaceflight undertakings during the last 30 years.

Wang Daheng [3769 1129 3801]

Chinese optics specialist, born 1915 in Suzhou, Jiangsu Province. After graduation from Qinghua University in 1938, he went on to pursue advanced studies in England at Imperial College, London, and at Sheffield University. Returned to China in 1948, he served for many years as director of the Optics and Precision Instruments Institute at Changchun. He did much pioneering work in certain branches of applied optics and made important contributions to China's spaceflight projects. He is now president of the China Optics Society, (concurrent) director of the Space S&T Center of the Chinese Academy of Sciences [CAS], delegate to the NPC, and member of the International Metrology Committee.



Ren Xinmin [0117 2450 3046]

Chinese rocket specialist, born 1915 in Ningguo County, Anhui Province. In 1934, he enrolled in Nanjing Central University. From 1945 on, he was a postgraduate student at the University of Michigan in the United States, where he received his doctorate in mechanical engineering. After return to China in 1949, he engaged in research on solid and liquid-fuel rocket engines and liquid-fuel rockets. He played a leading role in the development of engines for medium and long-distance carrier rockets and together with relevant staff solved several key problems in rocket engine construction. As highest authority in charge of carrier rockets, he was in command at the launching of China's first artificial earth satellite. Later again, as highest authority in charge of research departments he took part in the various activities in connection with the launch and recovery of satellites. He is chief designer in China's experimental communications satellite projects, and participates directly in the development of carrier rockets and liquid-oxygen and liquid-hydrogen engines. He has served successively as professor, head of design department, vice president of CAS, vice minister in the Seventh Ministry of Machine-Building, and chief engineer in the Ministry of Astronautics. He is now director of the S&T Commission of the Ministry of Astronautics and president of the China Spaceflight Society. He is member of the Scientific Council of CAS, delegate to the NPC, and member of the Standing Committee of the Fifth and Sixth NPC.

Zhuang Fenggan [8369 6646 3927]

Chinese aerodynamics specialist, born 1925 in Changzhou City, Jiangsu Province. In 1947 he went to the United States, where he received his doctorate in 1950 from the California College of Science and Engineering, returning to China the same year. He taught or did research successively at Shanghai Jiaotong University, the Mathematics Institute of CAS, Beijing University, and the Military Engineering College of the PLA. After 1956, he served successively as director of the Beijing Aerodynamics Institute, deputy director of the China Aerodynamics Research and Development Center, and chief engineer in the Ministry of Astronautics. For many years he was engaged in research and experimental work with missiles, rockets, and the aerodynamics of aircraft reentry. He directed the construction of many of China's wind tunnels and made important contributions to China's spaceflight projects. In later years, he devoted his studies to computer-assisted aerodynamics; he published "On the Trailing of Shock-Waves" and many other articles. He is a vice president of CAS, vice chairman of the S&T Commission of the Ministry of Astronautics, member of the Scientific Council of CAS, vice president during the third term of the China Aviation Society, and first-term president of the China Aerodynamics Society.

Lu Baowei [0712 0202 4850]

Chinese radio physics scientist, born 1916 in Changzhou, Jiangsu Province. He graduated in 1939 from Qinghua University and in 1943 went to the United States for graduate studies at MIT and Harvard. In 1947 he earned his doctorate at Harvard. Before returning to China, he did research at Harvard University on the ionosphere and on electric wave transmission. On return to China in 1949,

he worked in the Ministry of Posts and Telecommunications, the Fourth Ministry of Machine-Building, and at the CAS. He did much work in such fields as radio physics, electric wave transmission, space physics, satellite orbit perturbation, and made great contributions to China's spaceflight projects. He served as director of the Electronics Institute of CAS, and is now president of the China Spaceflight Society, director of the China Electronics Society, member of the Scientific Council of CAS, and delegate to the Fifth and Sixth NPC.

Sun Jiadong [1327 1367 2767]

Chinese astronautics specialist, born April 1929 in Fuxian, Liaoning Province. He entered Harbin Industrial University in 1948, and in 1958 graduated from the Rokossovskiy Aviation Engineering School in the Soviet Union. After his return to China, he took part, from 1958 to 1967, in the initial stage of developing surface-to-surface missiles and launch vehicles and served as chief designer for China's self-propelled medium-range missiles. Since 1967, he has played a leading role in the development and launching of China's first artificial earth satellite and remote-sensing re-entry satellites. He was chief designer of China's first experimental communications satellite and made important contributions to the development of China's astronautics. He served successively as deputy director of the Overall Planning Department, president of the Chinese Academy for Spaceflight Technology, and in other capacities. He is presently vice minister and chief engineer in the Ministry of Astronautics, vice chairman of its S&T Commission, and vice president of the China Spaceflight Society.

Yang Nansheng [2799 0589 3932]

Chinese rocket specialist, born 1921 in Haicheng County, Fujian Province. He graduated in 1943 from Southwestern United University and in 1947 went to England for graduate studies at Manchester University, where he obtained his doctorate in 1950, returning to China the same year. He mainly engaged in solid-state physics research and is assistant research fellow at the Physics Institute of CAS. Since 1958, he has participated in the development of space exploration rockets and solid-fuel rocket engines. He served successively as vice director of the Shanghai Mechanical and Electrical Design Institute, vice director of the research department of the Seventh Ministry of Machine-Building, vice director of the Astronautics Bureau, and has made important contributions to the development of China's space exploration rocketry and astronautics. He is chief engineer in the Ministry of Astronautics, first-term vice president of the China Astronautics Society, and delegate to the Fifth and Sixth NPC.

Yang Jiachi [2799 0857 1062]

Chinese autocontrol specialist, born 1919 in Wujiang County, Jiangsu Province. He graduated in 1941 from Shanghai Jiaotong University and in 1949 obtained his doctor's degree in applied physics at Harvard University in the United States. After his return to China in 1956, he played a leading role in formulating plans for the development of China's artificial satellite and served as chief designer in the development and in directing work on China's

satellite re-entry control system and in other scientific satellite experiments, where he made important contributions to the development of China's astronautic undertakings. He served successively as vice director of the Automation Institute of CAS, director of the Beijing Control Engineering Research Institute, and vice president of the China Space Technology Research Institute. He is presently deputy director of the S&T Commission of the China Space Technology Research Institute, vice chairman of the Committee on Spaceflight in the International Federation for Autocontrol, and vice president of the International Astronautics Federation.

Lu Yuanjiu [7120 0337 0046]

Chinese astronautics specialist, born 1920 in Laian County, Anhui Province. In 1945 he left for studies in the United States, where he earned his doctorate of science from MIT in 1949. He returned to China in 1956 and successively participated in working out the "Twelve-Year All-China S&T Development Plan" and the "Ten-Year S&T Development Plan," directed by Premier Zhou Enlai, and in preparations for the establishment of the Automation Institute of CAS. Since 1958, he devoted himself to astronautics and for many years engaged in research on autocontrols. He made important contributions to China's astronautic undertaking. He published, among other writings, "Principles of Gyro and Inertial-Guidance Navigation," and "Inertial Instruments and Components." He is presently chief engineer in the Ministry of Astronautics, member of the Scientific Council of CAS, director of the China Spaceflight Society, and member of the CPPCC.

Chen Fangyun [7115 5364 0336]

Chinese radio electronics scientist, born 1916 in Huangyan County, Zhejiang Province. He graduated in 1938 from Qinghua University. From 1945 to 1948, he worked in England in the research department of the Cossor Radio Factory. After the founding of the PRC, he came to work at the Physics Institute and Electronics Institute of CAS and did pioneering work in radio electronics research in China. He successfully completed, singly or in cooperation with others, many electronic projects urgently needed in China. After 1966, he primarily developed a radio measuring control system for Chinese artificial earth satellites and as chief designer was responsible for the development and technological coordination of microwave-regulated unified control systems for China's experimental launching of communications satellites. He made important contributions to the initiation of China's satellite plotting network. He is member of the Scientific Council of CAS and concurrently vice director of its technology and science department.

Liang Shoupan [2733 1343 2857]

Chinese rocket specialist, born 1916 in Fuzhou City, Fujian Province. He graduated in 1937 from Qinghua University and in 1939 obtained a master's degree in aeronautics from MIT. After his return to China in 1940, he taught at Southwestern United University and in the aeronautics department of Zhejiang University as professor and head of the department. After the founding of the PRC, he taught at the Military Engineering College of the PLA. In 1956 he

started to engage in the development of rockets and missiles. He served as director, chief designer of ballistic missiles, and head of research section of the Overall Planning Department, and vice president of CAS. In the process of developing a variety of missile models, he solved many key technical problems and was awarded the State Council's prize for creative inventions. He is vice president (first term) of the China Astronautics Society, also of the China Engineering Thermophysics Society, and China Aeronautics Society. He is a member of the Scientific Council of CAS, chief engineer in the Ministry of Astronautics, vice chairman of the S&T Commission, and member of the CPPCC.

Cao Hesun [2580 7729 1327]

Chinese aeronautics and astronautics educator and aerodynamics scientist, born 1912 in Jiangyin County, Jiangsu Province. After graduating in 1934 from Shanghai Jiaotong University, he left for Italy to study aerodynamics. He received his doctorate in 1936. On his return to China in 1937, he taught aeronautics and astronautics. He was professor at Jiaotong University, the Military Engineering College of the PLA, and professor and vice president of the National Defense S&T University. For many years he worked in the field of theoretical aerodynamics, mathematics for elastoplastic mechanics and aerodynamic elastoplastic mechanics. Later, he mainly engaged in research on magnetohydrodynamics. Among his main publications are "Hydrodynamics" and "Aerodynamic Elastomechanics." He is a member of the Standing Committee of the CPPCC, chairman of the Hunan Provincial Political Consultative Conference, delegate to the NPC, first-term vice president of the China Astronautics Society, vice president of the China Aerodynamics Research Society, and member of the Standing Committee of the China Aeronautics Society.

Cai Jintao [5591 6855 3447]

Chinese radio electronics scientist, born 1908 in Nantong County, Jiangsu Province. He graduated in 1930 from Shanghai Jiaotong University, and in 1934 went to the United States, where he earned a master's degree in telecommunications engineering at the Graduate School of Harvard University. He returned to China in 1937. After the founding of the PRC, he served successively as chief engineer and vice president at the Beijing Academy for Electronics Technology. He accomplished outstanding achievements in the fields of precision measurement of electromagnetic potential, exploring the height of the ionosphere, and in manufacturing techniques for electric vacuum devices and components. For a long time, he directed research and trial manufacture of Chinese rocket and missile guidance systems and other radio technologies, with particularly successful results in his research of guidance systems, guidance theory, and guidance methods. He is a member of the Scientific Council of CAS, vice president of the China Electronics Society, vice president of the China Metrology Society, and technical advisor to the Ministry of Astronautics.

9808/9738

CSO: 4008/17

END